RUBBER RESEARCH INSTITUTE OF CEYLON

ANNUAL REPORT 1958

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ANNUAL REPORT OF THE RUBBER RESEARCH INSTITUTE OF CEYLON—1958

The present report is the twenty-eighth annual report of the Rubber Research Institute of Ceylon as constituted under the Rubber Research Ordinance (Cap. 302) and amended by Rubber Research Amending Ordinance No. 63 of 1946 and Amendment Acts No. 27 of 1948, No. 7 of 1950, No. 30 of 1951, No. 50 of 1953, No. 3 of 1955, No. 8 of 1957 and No. 52 of 1957.

DIRECTOR'S REPORT

By

E. D. C. Baptiste

Several innovations and achievements made during the year under review call for special mention.

The rate of cess for rubber research was increased from 55 cents to 82½ cents per 100 lb. of rubber exported from Ceylon with effect from 1st January.

An interest-free loan of one million rupees has been sanctioned by Government for the establishment and development of three sub-stations, each of about 200 acres, in the Sabaragamuwa, Kegalle and Galle districts respectively. An advance of half this amount has already been received.

It had been intended to establish the first sub-station in the Sabaragamuwa district and a special committee appointed by the Rubber Research Board visited on three occasions several estates without, however, finding an area suitable for the purpose which could be purchased at a reasonable cost. The search continues.

Membership of the Colombo Medical Scheme Limited was extended to cover members of the Senior Staff of the Institute. A similar scheme has been made available for the Intermediate and Assistant Staff.

It is gratifying to record the successful establishment in the Institute's nurseries of 47 Dothidella-resistant Hevea clones (some of which are also tolerant to Phytophthora) which the writer personally selected in Costa Rica and Brazil and budwood of which he obtained from the United States Department of Agriculture Plant Introduction Station in Miami, Florida, in December, 1957. Also of three of the most promising Firestone clones and of 24 selected Dothidella-resistant (FX and IAN) clones received from Firestone Plantations Company, Harbel, Liberia, in August, 1958.

These Dothidella-resistant clones consist mostly of the first back cross of a Brasiliensis × Benthamiana hybrid with the Eastern parent (PB 86 or Tjir 1) and are three-quarters Eastern and one-quarter Benthamiana.

All but five of the 26 Dothidella-resistant clones of the second back cross, which are seven-eighths Eastern and only one-eighth Benthamiana, obtained in exchange from the Instituto Agronomico do Norte, Belem, Brazil, have been successfully established at the U.S.D.A. Plant Introduction Station in Florida in July, 1958. Budwood of these clones may be expected in Ceylon in the Summer of 1959.

These imported clones will be used in breeding work with the object of combining high yield with disease resistance.

A Plant Breeding Section of the Botany Department was formed in early July with the assignment of a Plant Breeder to the Institute through the "Technical Aid Program" of the United States Operations Mission to Ceylon. This officer is stationed on Nivitigalakele Division and works in close association with the Botanist.

The designation Agronomy Department was changed to Soils Department, by which name it was known prior to 1951.

Two rhizobial strains have clearly demonstrated their ability to fix Nitrogen in association with Pueraria phaseoloides in sand or soil medium in pot culture.

Twenty-one selected new clones from Malaya, Indo-China, Sumatra, Java and Ceylon have been established in 300-tree plots on two collaborating estates during the year.

Laboratory and field trials have shown the marked effectiveness of two organomercury compounds as fungicides for the control of fungous diseases of Hevea. These are Tillex Liquid, for the control of White Root disease caused by Fomes lignosus, and Antimucin, for the control of bark rot caused by Phytophthora palmivora.

A total of 4,782 acres of smallholders' rubber which was sulphur dusted under the ægis of the Smallholdings Department constitutes the largest acreage of smallholdings dusted against Oidium in any one season.

A section headed "Planting Topics" and "Question Corner" introduced in the Institute's Quarterly Circulars for 1958 has met with a good reception.

The new cover design, lay out and format of this Annual Report will also be used for all future Quarterly Journals of the Institute.

STAFF

Senior Staff:

The Director, Dr. E. D. C. Baptiste, resumed duties on 27th February on his return from overseas leave and after a short visit to the Firestone Plantations Ltd., Liberia, West Africa, in connexion with arrangements for the exchange of clones.

The Botanist, Mr. C. A. de Silva, acted for the Director until 26th February. He was on duty throughout the year.

With the arrival of the Plant Breeder, Mr. W. E. Manis, during the last week of June, a Plant Breeding Section of the Botany Department was formed.

Mr. D. H. Constable, Agronomist, left Ceylon on 14th December, 1957. The designation of the Agronomy Department was changed to Soils Department with effect from 28th March and the Assistant Soils Chemist, Mr. A. J. Jeevaratnam, was in charge of the Department. The post of Soils Chemist remained vacant during the period under review.

Dr. E. J. Risdon, Chemist, resigned his post and left the Island on 19th May on the termination of his contract. The work of the Chemistry Department was continued under the supervision of the Director until the appointment of the new Chemist, Dr. K. F. Heinisch, who assumed duties on 29th December.

Dr. A. Riggenbach, Plant Pathologist, was on duty until 4th December, when he left Ceylon on end-of-contract leave, and Mr. O. S. Peries, Assistant Plant Pathologist, was in charge of the Department during the rest of the year.

The Smallholdings Advisory Officer, Mr. R. T. Wijewantha, the Administrative Secretary, Mr. C. D. de Fonseka, the Estate Superintendent, Mr. L. Wijeyagunawardene, the Assistant Plant Pathologist, Mr. O. S. Peries, and the Assistant Soils Chemist, Mr. A. J. Jeevaratnam, were on duty throughout the year.

Mr. D. M. Fernando, Assistant Plant Breeder, was promoted to Senior Staff Grade II and was on duty throughout the year.

Intermediate Staff:

Mr. L. B. Chandrasekera, Research Assistant, Botany Department, returned to Ceylon on 14th August after the successful completion of his course of training for the Diploma in Agricultural Science of the University of Cambridge. He was on duty during the rest of the year.

Mr. M. Nadarajah, Research Assistant, Chemistry Department, was absent throughout the year on study leave under a Colombo Plan Scholarship at the University of Birmingham.

Mr. N. W. Palihawadena, Senior Assistant Advisory Officer, Smallholdings Department, retired from service on 30th September.

Mr. H. H. Peiris, Assistant Advisory Officer, Smallholdings Department, was on duty throughout the year. He was promoted to Senior Assistant Advisory Officer and assumed duties at the Smallholdings Department Headquarters on 1st October.

Mr. K. Wilson de Silva, Assistant Advisory Officer, Smallholdings Department, was on duty throughout the year.

Mr. D. E. A. Abeyawickrema, District Field Officer, Smallholdings Department, was promoted as an Assistant Advisory Officer of the department with effect from 1st October.

Mr. Douglas de S. de Fonseka, was appointed Assistant Estate Superintendent, Dartonfield Group, with effect from 1st June.

Assistant Staff:

The Staff position in the Administrative Department was as follows:—

One Office Assistant	One Accounting Assistant
Four Clerk-Typists	One Pay Clerk

One Record Clerk	One Book-keeper
One Junior Clerk	One Storekeeper
One Assistant Librarian.	Two Accounts Clerks

One Personal Assistant to the Director

A number of changes in Assistant and Minor Staff in the Technical, Estate and Smallholdings Departments occurred as shown in the respective departmental reports.

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

Senior Staff Grade I	7
Senior Staff Grade II	3
Intermediate Staff	6
Assistant Staff	114
Minor Staff	45
Total ...	175

GENERAL

The Director served as *ex-officio* Vice-Chairman of the Rubber Research Board and as a member of the Smallholdings and Administrative Committees of that Board. He also served as a member of the Rubber Replanting Advisory Board, of the Central Board of Agriculture and on the committee of the Kalutara District Planters' Association.

MEETINGS

The Director attended the following meetings:—

Rubber Research Board	1 (Acting Director on 7/2) 5 (Director on 28/3, 11/6, 29/8, 30/10, 7/12)
Administrative Committee, R.R.B.	1 (Acting Director on 20/1) 6 (Director on 14/3, 16/5, 12/8, 30/9, 9/10, 4/12)
Smallholdings Selection Committee	5 (on 16/4, 19/6, 25/7, 11/8, 22/8)
Smallholdings Committee, R.R.B.	1 (on 25/7)
Salaries Committee, R.R.B.	1 (Acting Director on 20/1) 2 (Director on 16/5, 12/11)
Building Committee, R.R.B.	1 (on 9/10)
Provident Fund Committee, R.R.B.	1 (on 3/10)
Other Sub-Committees, R.R.B.	7 (on 22/3, 26/3, 25/4, 29/5, 25/6, 12/8, 27/8)
Staff Committee, R.R.I.C.	2 (on 19/8, 20/9)

Rubber Replanting Advisory Board	7 (Acting Director on 13/1, 21/1, 30/1, 12/2, 24/2, 1/7, 11/7) 24 (Director on 10/3, 21/3, 10/4, 22/4, 7/5, 20/5, 29/5, 11/6, 19/6, 16/7, 24/7, 4/8, 14/8, 27/8, 5/9, 17/9, 29/9, 10/10, 22/10, 3/11, 12/11, 26/11, 8/12 and 22/12)
Planters' Association of Ceylon	4 (on 28/3, 17/6*, 12/8, 14/10)
District Planters' Associations:	
Kalutara	3 (on 5/3*, 20/8*, 3/12*)
Kelani Valley	1 (on 20/3*)
Sabaragamuwa	1 (on 18/11*)
Kurunegala	1 (29/11*)
Low-Country Products Association	1 (on 22/3)
Ceylon Chamber of Commerce	1 (on 27/3)
T.R.I. Appointments Committee	3 (on 29/3, 2/4, 21/6)
London Advisory Committee for Rubber Research (Ceylon and Malaya)	2 (on 30/6*)
Appointments Committee in London	2 (on 4/7)
Central Board of Agriculture	1 (on 8/8)

* Meetings Addressed by Director.

VISITS

Estates: The Director paid 31 visits to 22 Estates during the year.

He also paid 14 visits to Nivitigalakele Station and 3 visits to Hedigalla Station.

Institutes: The Director visited the Tea Research Institute and the Ceylon Institute of Scientific and Industrial Research.

Heneratgoda Botanical Gardens: To show the first rubber trees planted in Ceylon in 1876 to Mr. Harlan L. Trumbull, a visitor from the U.S.A.

Smallholdings: The Acting Director was present at the inauguration of the State Aided Sulphur Dusting Scheme for Smallholdings by the Hon'ble the Minister of Agriculture and Food on 11th February at Kaluaggala in Kosgama range.

Hedigalla Colonization Scheme: A visit of inspection was paid by the Acting Director on 17th February.

Visits in Europe and West Africa:

During his overseas leave the Director visited at the University of Cambridge the Botany School, the School of Agriculture and the Plant Breeding Institute in

connexion with the post-graduate Diploma Course of Agricultural Science taken by the Research Assistant, Botany Department, Mr. L. B. Chandrasekera, Colombo Plan Scholar at the University of Cambridge.

The opportunity was taken to discuss this post-graduate course with the University Lecturer in Genetics, the Director of the Plant Breeding Institute, the Reader in Soil Science and the Reader in Crop Husbandry.

A member of the staff of the School of Agriculture, Cambridge, and a member of the Agricultural Chemistry Department of the Imperial College of Science and Technology, London, were interviewed in connexion with the vacant post of Soils Chemist at the Institute.

The laboratories of the British Rubber Producers' Research Association, of the Rubber Technical Developments Ltd. at Welwyn Garden City, of the Rothamsted Experimental Station at Harpenden, Hertfordshire, and of the Institut Français du Caoutchouc, Paris, France, were also visited.

With the approval of the Rubber Research Board, the Director, on his way to Ceylon, visited Liberia where he spent a day at the new plantation of B. F. Goodrich Ltd. situated 45 miles N.W. of the capital, Monrovia, and the 82,000 acre Harbel estate of Firestone Plantations Company where he spent four days with the Director of Research, Dr. K. G. McIndoe.

As a result of this visit three clones, including Harbel 1, were introduced into Ceylon in exchange for Ceylon clones.

An arrangement was also made for the exchange with the R.R.I. of Ceylon of a number of Instituto Agronomico do Norte clones of the first back cross and outcross imported into Liberia from the U.S.D.A. Plant Introduction Station, Miami, Florida, in 1953 and established in field trials at Harbel in 1955 and 1956.

The Director then called at Abidjan, French Ivory Coast, where he visited the young Institut des Recherches sur le Caoutchouc en Afrique (I.R.C.A.) and three estates in course of development, namely, the Bogo and the Toupah plantations of the Société Africaine de Plantations Hévéa and the Eleiss plantation of the Compagnie Générale Africaine, accompanied by the Director of the I.R.C.A., Mr. H. de Breuvery.

The Director left for London by air on 26th June where he attended on 30th June, at the Commonwealth Institute, meetings of the Agricultural Sub-Committee and of the main Committee of the London Advisory Committee for Rubber Research (Ceylon and Malaya) at which was also present the Director of the Rubber Research Institute of Malaya.

He also sat on Selection Committees at the Commonwealth Institute and interviewed applicants for the posts of Rubber Chemist, Soils Chemist and Librarian advertised by the Rubber Research Institute of Ceylon.

PUBLICATIONS

The following reports and articles were prepared by the Director:—

(1) For information of the Rubber Research Board:

(*a*) Director's Report for 1957
(*b*) Director's Report for 1st half-year 1958
(*c*) Research Programmes for 1959

(2) For information of the Rubber Replanting Advisory Board:

"Density of Planting and Selection Thinning out in Rubber Plantations" by the Acting Director.

(3) Contributions to 1957 Annual Report of the Planters' Association of Ceylon and of the Low-Country Products Association, to the Ceylon National Memorandum for the Meeting of the International Rubber Study Group:

"Work of the Rubber Research Institute in 1957" by the Acting Director.

(4) Contribution to the Annual Report of the Commonwealth Agricultural Bureaux, sent to the Director of Agriculture:

"Progress of Rubber Cultivation under Ceylon conditions."

(5) Contribution to the Ferguson's Ceylon Directory 1958:

"Rubber Industry" by the Acting Director.

(6) Contribution to the Ceylon Year Book 1958:

"Work of the Rubber Research Institute of Ceylon in 1957" by the Acting Director.

(7) Contribution to the Division of Social Affairs, United Nations Technical Assistance Board, Colombo:

"The Work of the Rubber Research Institute of Ceylon."

(8) For publication in R.R.I.C. Quarterly Circulars for 1958:

(*a*) "A Simple Means of Improving Latex Quality"
(*b*) "Waterproof Dressings not a Cure for Bark Rot"
(*c*) Answer to Question, "Would you recommend pinching off the terminal bud of 1 to 1½ years old buddings of clone PB 86 in order to provide a better balanced tree and to accelerate girthing?"
(*d*) "Thumb Nail Pruning of Young Budded Plants"

The following mimeographed Advisory Leaflets were issued:—

2- 1-1958—No. PP/58/1	— Notes for the Phytophthora Season 1958.
25- 1-1958—No. C/58/1	— Further Comments on the Contamination of Natural Rubber by Fungicidal Dusts Containing Copper.
17- 5-1958—No. C/58/2	— Further Comments on the Contamination of Natural Rubber by Fungicidal Dusts Containing Copper, Part II.
22- 5-1958	— Phytophthora Questionnaire, 1958.
18-11-1958	— Temporary Shortage of Saphos Phosphate.
10-12-1958	— Oidium Questionnaire, 1958/59.

The following publications were issued:—

(*a*) Annual Report of the Rubber Research Institute of Ceylon for 1957.

(*b*) Combined 1st and 2nd Quarterly Circulars for 1958.
,, 3rd and 4th ,, ,, ,, 1958.

(*c*) Advisory Circular No. 60 — Sale of Budwood (Superseding Adv. Cir. No. 42).
,, ,, No. 61 — Prevention of Coagulation in the Field (Superseding Adv. Cir. No. 53).
,, ,, No. 62 — The White Root Disease of Hevea, Fomes Lignosus (Superseding Adv. Cir. No. 46).
,, ,, No. 63 — Brown Root Disease of Hevea, Fomes Noxius (Superseding Adv. Cir. No. 48). (In press).
,, ,, No. 64 — Bark Rot and Canker of Hevea, Phytophthora Palmivora (Superseding Adv. Cir. No. 54). (In press).
,, ,, No. 65 — The Phytophthora Leaf Disease of Hevea, Phytophthora Palmivora. (Superseding Adv. Cir. No. 45). (In press).

(*d*) Smallholdings Folders: No. 4A — Sulphur Dusting of Smallholdings 1958/59.
No. 5 — Manuring of Rubber.

VISITORS

Visitors to the Institute during the year included the following:—

1st half year:

Members of the Soviet Trade Delegation headed by Mr. P. A. Maletin.
Mr. Takuma Tanada, Agronomy Adviser (Research), U.S.O.M., Ceylon.
Colonel K. E. Savill, Chairman, Sunnygama Co., Ltd.
Mr. J. R. Graham, Plant Protection Ltd., London.
Mr. W. Lloyd, United Nations Organization Rubber Replanting Expert, F.A.O., Regional Office, Bangkok.
Dr. Hans Keller, Chargé d'Affaires of the Legation of Switzerland, Colombo.
Monsieur Michel Dupont, Counseiller Commercial de France, Colombo.
Dr. K. Mellanby, Head of the Department of Entomology, Rothamsted Experimental Station.
Dr. A. W. R. Joachim, Acting Director, Tea Research Institute of Ceylon.
Dr. Harlan L. Trumbull, formerly Manager of Rubber Research, B.F. Goodrich Research Centre, Brecksville, Ohio, and Director of Research and Development, Office of Rubber Reserve, U.S. Government.
Dr. Dorothy Needham, F.R.S., and Prof. Joseph Needham, F.R.S., Head of the University Commission.
Five members of a Delegation from the People's Republic of China.
A Mission of 5 Agricultural Experts from the People's Republic of China.
Committee appointed by the Director of Census and Statistics to examine the methods presently in use in the compilation of Statistics of the cost of production of Tea, Rubber and Coconut.
Mr. W. G. L. Austin, Plant Protection Ltd., Fernhurst, Surrey.
Dr. K. F. Heinisch, Research Institute of the Sumatra Planters' Association.
Mr. Stanley I. Phillipi, Chief Natural Resources, U.S.O.M., Ceylon.
Mr. Jack R. Morris, Acting Food and Agriculture Officer, U.S.O.M., Ceylon.

2nd half year:

Mr. K. F. Kavanagh, Technical Representative, Fisons (Ceylon) Ltd.
Dr. Aslam Zafar, Director of Agriculture, Pakistan.
Mr. G. R. Iredale of Messrs. I.C.I. (Export) Ltd., Calcutta.
U. Min Maung, Burmese Government trainee.
Dr. Arthur W. Sloan, Chairman of the Board of Atlantic Research Corporation, Alexandria, Va., U.S.A.
Mr. A. J. Butler, Plant Protection Ltd., London.
Mr. James Mearns, Field Branch, Firestone Plantations Co., Harbel, Liberia.
Members of the Administrative Committee, R.R.I.C.
Dr. Herbert Moser, Assistant Attaché of the Legation of Switzerland, Colombo.
Mr. M. M. Varghese, Manager, A. V. Thomas & Company, Ltd., and President of the United Planters' Association of Southern India, Coonoor, S. India.
Mr. T. V. Prior, Murphy Chemical Company Ltd., London.
Mission for the International Bank for Reconstruction and Development, Washington, D.C., including Mr. W. M. Gilmartin and Mr. John A. Edelman.
Mr. D. Mulder, Plant Pathologist, Tea Research Institute of Ceylon.
Mr. Northrop K. Kirk, Second Secretary, American Embassy, Ceylon.
Mr. H. B. Bruce, Manager, Wardieburn Estate, Kuala Lumpur, Malaya.
Mr. E. K. Moser, Agronomist, Messrs. A. Baur & Co., Ltd., Colombo.
Mr. J. H. Pidford, General Manager, H. & C. Latex Ltd., Petaling, Malaya.
Mr. S. Mitra, Rubber Technologist, I.C.I. (Export) Ltd., Tiljala.
Mr. D. M. Patterson, Earlington, Ky., U.S.A.
Mr. Visio, Technical Delegate, M/s. Wild Heerbrugg.

CORRESPONDENCE

Correspondence figures were as follows:—

	Inward	*Outward*
Director { General	1,652*	850
Director { Technical	365†	460†
Administrative Department	3,350	4,856
Botany Department	239	217
Plant Pathology Department	671	868
Soils Department	433	389
Chemistry Department	301†	294†
Estate Department	609	1,315
Smallholdings { General	4,765	9,341
Department { With Rubber Controller	488**	8,259††
	12,873	26,849

* includes applications for staff vacancies.

† includes Chemistry Department correspondence handled by Director

** includes 427 packets of New Planting applications, etc.

†† includes 4595 preliminary reports, 3064 Final Inspection reports and 600 special reports.

NOTES ON DEPARTMENTAL REPORTS

Botany:

A trial of promising local and foreign clones with clone PB 86 as control has been established during the year in a 32½ acre replanting of a collaborating estate

in the Kalutara district. There are 300-tree blocks of each of 17 clones and a manurial experiment with three levels of Potash has been superimposed on blocks of six of the clones under trial. This is the third trial of imported foreign clones laid down on collaborating estates pending the establishment of R.R.I. sub-stations in other rubber growing districts of Ceylon.

Of the RRIC clones established in small-scale trials in 1943 and 1944 ten have yielded more than 30 lb. per tree in 1958 and of these clones four, namely, RRIC 28, 41, 45 and 75 have yielded more than 40 lb. per tree during the same period, the yield being based on 2 to 3 trees of each clone. Several of the younger RRIC clones established in trials in 1947 and 1948 show promise of high yield and fifteen of these clones have yielded over 20 lb. of dry rubber per tree during the year, the yield being based on 5 trees of each clone in small-scale trial.

The test tapping of clonal seedlings of the 1939 to 1945 hand-pollination programmes established on R.R.I. stations and on collaborating estates was continued during the year.

Experiments on yield stimulation carried out on 30-year old budded trees tapped on high (ladder) cuts have shown a yield increase during the first year of 50 per cent over the control trees also tapped alternate daily on a high "V" cut. The treated trees had received two applications of a proprietary yield stimulant at intervals of six months.

Breeding and Selection work continues to receive high priority and, as a preliminary to the commencement of a large-scale programme of breeding for resistance to diseases, selections of crosses of the Oidium-resistant clone LCB 870 with clone PB 86 and other clones have been used for further crossing with high-yielding, vigorous clones amongst which are clones RRIC 52 and LCB 1320 which seem partially tolerant to Oidium and Phytophthora diseases.

A Plant Breeding Section of the Botany Department was established in July, 1958. The programme of this Section is to continue the present line of Hevea breeding carried out by the Botany Department and to lay down guide lines for the future breeding work to be conducted when flowering material of introduced South American Leaf Blight (*Dothidella ulei*) resistant clones becomes available.

Investigations on methods of stimulating early flowering in Hevea form an important phase of this Section's immediate programme. Pollen storage studies, using the deep freeze method, is another project to be implemented.

The aim of this Section is to establish a firm and sound basis for the Institute's breeding programme so that the future planting material for the Rubber Plantation Industry of Ceylon will have not only high yield and favourable secondary characters but will also possess resistance to Dothidella and to Oidium and tolerance to Phytophthora. To obtain these results in the most practicable way and in the shortest time possible the standard back cross method in plant breeding is the avenue of approach being followed.

Plant Pathology:

The incidence of the Oidium leaf disease during the refoliation period was mild in most districts and many estates reported a complete absence of the disease. Experiments laid down on these estates for the control of Oidium consequently yielded no useful results.

In a few instances, however, where wintering was long drawn out and adequate control measures were not adopted fairly severe attacks were recorded, especially on the more susceptible clones such as Tjir 1 and BD 5. On one estate severely affected with Oidium a new type of dusting machine, the electroduster, showed some advantage over the type of sulphur dusting machine in common use.

Leaf fall due to Phytophthora leaf disease, although fairly heavy in some districts, was less severe in 1958 than during the previous year; the disease affecting the Kalutara district more than the other rubber growing districts of the Island.

Ten field experiments covering a total area of 248 acres distributed over 5 Estates were carried out during the year to test the relative effectiveness of copper-based, organo-metallic and organic fungicides. The copper-based dusts proved to be the most effective and the most economical, no difference being found between cuprous oxide and copper oxychloride preparations or between the various proprietary brands of fungicide containing 4 per cent copper. A rate of application of 8-10 lb. per acre and round, with dusting rounds spaced at about 5-day intervals, gave adequate protection.

A proprietary copper-based dust with a special incorporated sticker and containing 1 per cent copper was found to be as effective as ordinary copper-based dusts containing 4 per cent copper.

Experiments on the control of bark rot disease of the tapping panel caused by Phytophthora palmivora have shown an organo-mercury compound, Antimucin, to be the most effective water-miscible fungicide tested. Laboratory results have been amply confirmed by large-scale field trials.

Laboratory tests of different chemicals for the control of Fomes lignosus, the fungus causing the White Root disease of rubber trees, have shown an organo-mercury compound, Tillex Liquid, to be the most effective of all fungicides tested. Tillex Liquid has, moreover, given excellent results under field conditions for the curative treatment of young rubber trees attacked by Fomes lignosus.

Soils:

This is the new designation of the former Agronomy Department.

An advisory service based on plant and soil analysis has been started and samples from eight Estates have been analysed during the year.

Two suspected cases of zinc deficiency in the field have been investigated and could not be established definitely as due to shortage of zinc in the soil.

An increase in the incidence of leaf symptoms of magnesium deficiency has been reported from several estates, in nurseries, young clearings as well as in mature plantings. The most susceptible clone is PB 86 but other clones, *e.g.* Tjir 1, have also been affected. Preventive measures recommended by the Institute consist of the incorporation of magnesium in NPK fertilizer mixtures, with the use of complete mixtures low in potash, *e.g.* R 4:6:2+Mg, and of the application of Dolomitic lime to provide a reservoir of slowly available magnesium. Curative treatment recommended consists of the application of small quantities of Epsom salts, depending on the severity of the deficiency.

The manurial trial in the 1938 clearing at Dartonfield which has over the years shown the importance of phosphate for growth and yield was terminated early in the year.

The NPK trial at Hedigalla has also shown consistent response to phosphate up to the time of tapping. Five manurial trials of a $4 \times 4 \times 4$ design were in progress during the year and a further $2 \times 2 \times 2$ NPK experiment was laid down on an Estate in the Moneragalla district with an annual rainfall of about 80 inches.

An experiment to test the effect of high, medium and low potash in NPK mixtures has been superimposed on a clone trial in the Kalutara district.

Two rhizobial strains that have clearly shown their ability to fix nitrogen under field conditions in new plantings have been multiplied in culture and issued to Estates on request.

Comparative studies of cover crops have been extended to include Guatemala grass (*Tripsacum laxum*) which is being increasingly grown on rubber estates to provide material for mulching (thatching) along the planting rows. This grass has been shown to contain a high percentage of potassium.

Chemistry:

The Chemist resigned in May and the Research Assistant was on overseas study leave during the year,

The absence of these officers has necessarily resulted in the curtailment of experimental and, to some extent, of advisory work of the Department. The Senior Technical Assistant has been responsible for the routine work of the Department under the general supervision of the Director,

The work started in 1957 on the limitation of contamination when copper-containing fungicidal dusts are used to control leaf fall due to Phytophthora palmivora has been continued and in this connexion two Information Leaflets were issued to Estates.

A request to Estates for samples of blended scrap for testing and further advice met with a poor response.

An appreciable number of Estates have been visited for advice on manufacturing problems of both crepe and smoked sheet and on prevention of pre-coagulation in the field. Advice has been given on the use of anti-coagulants, bulking of latex to obtain a uniform product, milling and drying of blanket crepe and of sheet.

Smallholdings:

Co-operative Sulphur Dusting of smallholdings has been expanded to meet the needs of smallholders and 4,782 acres in 1,471 holdings were successfully dusted during the Oidium season. This constitutes the largest acreage of smallholdings to be dusted in any one season.

A survey of infection of smallholdings by the White Root disease caused by Fomes lignosus has revealed a high incidence of the disease. 2,243 smallholdings (21.2%) replanted during the 4-year period 1953-1956 were found to be infected, but the extent of infection within a holding was generally small.

Field Officers of the Department conducted 520 sheetmaking demonstrations in addition to 183 tapping and 593 disease control demonstrations.

Considerable assistance was given to smallholders to replant their lands in accordance with the requirements of the Rubber Replanting Subsidy Scheme, and in this connexion 2,376 holdings covering 3,196 acres were lined by Rubber Instructors for soil conservation works and 2,998 holdings covering 4,181 acres were lined for planting holes.

A considerable portion of Rubber Instructors' time was also taken on general advisory visits in respect of New Plantings. In this connexion 649 acres in 451 holdings were lined for planting holes and 557 acres in 420 holdings were lined for soil conservation works.

Estate:

The Institute's stations of Dartonfield, Hedigalla and Nivitigalakele have a planted acreage of 1,027. The immature rubber acreage stood at 620 at the end of the year and the acreage in tapping was 384, giving an average yield of 687 lb. of dry rubber per acre for the year.

The Rubber Replanting Subsidy Scheme nursery (77 acres) at Hedigalla remained in full production, providing approximately 154,000 Tjir 1 seedlings and 70,000 PB 86 budded stumps during the year.

The incidence of Oidium was very light but that of Phytophthora leaf fall and bark rot, particularly at Hedigalla, was more pronounced than in the previous year.

The Visiting Agent paid two visits during the year.

Departmental Reports:

The reports of the various departments follow under their respective headings:—

REPORT OF THE BOTANY DEPARTMENT

By

C. A. de Silva

SUMMARY

Field Experiments:

The total area of experimental plantings on the Institute's Stations is 1,025½ acres. The experiments supervised and reported on by the Botany Department cover an area of 317 acres of mature budded rubber in test tapping. Further areas of immature rubber of 456 acres will come into test tapping as the trees in particular field trials reach tappable girth.

The immature rubber consists mostly of high yielding clones planted in large-scale trials from 1953 to 1957. The layout of plots is in tapping tasks of 300 trees of each clone or 3 to 5 replications of 200-tree plots of each clone. This procedure eases considerably the test tapping in future years, as a plot unit of 200 to 300 trees is tapped by a single tapper. This does not prevent the selection of small plots centrally for statistical analysis of randomized and replicated plots, without boundary effects between different clones.

The clones planted in these areas have been established from hand-pollinated seedlings representing crosses of the best known high yielding foreign and local clone parents. Three-tree or five-tree clones, representing the original budgrafts established from 2 to 3-year old crossed seedlings, have been tapped for many years.

All the clones selected for further trial have shown yields of about 20 to 40 lb. dry rubber per tree per year.

Until our Hedigalla Station was fully developed for continued new planting it was necessary to plant a proportion of our hand-pollinated seedlings and derived five-tree clones on nine commercial estates. The test tapping on these estates will be discontinued from 1959. The itinerating field staff will be used to develop the large-scale clone trials of foreign and local clones planted on commercial estates in 1957 and 1958.

In 1957 and 1958 three tapping experiments were initiated on the Institute's Stations for preliminary studies on the feasibility of increasing the yields of old budded rubber, which are not up to the standards of economic yields required at the present time, by tapping on high cuts with and without yield stimulation. Unfortunately we have no old seedling rubber in the Institute's Stations to experiment on for increased yields.

Most of the old seedling rubber in Ceylon is now well over 40 years of age. On many estates the tapping has reached a 200 per cent intensity, bordering on slaughter tapping methods. Under these conditions it is extremely improbable that the use of yield stimulants will lead to economic increased yields, especially in the absence of any virgin bark above the normal tapping panels.

Other investigations of the Botany Department deal with avenue systems of planting, crown budding with low-yielding disease-resistant clones, selective thinning out of high stands of clones and clonal seedlings, and minor laboratory and greenhouse experiments. These latter investigations which have been carried out by the Research Assistant are of an exploratory nature.

A more permanent programme of laboratory work will only be possible when the Botany Department is transferred to roomier quarters by the end of 1959.

The results for 1958 are presented and commented on in a more concise form than in former years by combining the results of test tapping of clones and clonal seedlings in single tables for the three stations of the Institute. This has been made possible by excluding most of the less promising clones and the seedling families of hand-pollinated crosses which have no practical importance in the production of clonal seedlings commercially.

Advisory Work:

The propaganda work carried out by the Smallholdings Department both in replanting and new planting work, and the increased circulation of planting information by the Rubber Replanting Subsidy Scheme have considerably reduced the advisory work of the Botany Department. The Botanist has made substantial contributions to the information circularised by the Subsidy Scheme.

In 1958 the Botanist has been called upon to make inspection visits to the Colonization Schemes initiated and supervised by the Government Agents and District Land Officers. Reports on these visits have been submitted to the Land Commissioner and Government Agents.

The correspondence of the Botany Department has been largely confined to planting programmes and to tapping information for increased yields from old seedling and budded rubber.

The number of visitors from estates and overseas has considerably increased in recent years and a substantial part of the writer's time has been taken up in taking these visitors round the Institute's experimental stations and in discussing topical rubber planting subjects and field investigations with them.

A talk was given to trainee Rubber Instructors of the Smallholdings Department of the Institute on the more important aspects of rubber cultivation.

Tapping Experiments:

Three preliminary experiments were initiated by the Botany Department for a study of the high tapping on moderate-yielding old budded rubber with and without the use of yield stimulants.

Old seedling rubber tapped at 133 per cent tapping intensity with virgin bark available for high cuts should give profitable returns with the use of yield stimulants. As an alternative to slaughter tapping good renewed bark tapped on 200 per cent tapping intensity with stimulation could give economic yields during the last two years before uprooting.

Trial with Upward "V" Cuts on Virgin Bark on Budded Rubber, 1935 Clearing, Nivitigalakele:

About 40 local clones of 25-tree plots each, yielding 600 to 700 lb. dry rubber per acre per year, were used for upward tapping on 100 per cent intensity in virgin bark, with the normal downward half-spiral cut on alternate days as a control.

A preliminary tapping was carried out on half-tasks from April to June, 1958. In the layout the initial yields were equalized before introducing the upward tapping in the half-tasks from August, 1958.

The upward cuts gave an increased yield of 46.7% over the control from August to December, 1958. On upward tapping the bark consumption is increased to about 9 to 10 inches per tapping year and the tapping task is halved.

It is possible to offset this increase in tapping costs by using yield stimulants with upward tapping. An experiment with ladder tapping on virgin bark tapped downwards, with and without yield stimulants, gives some information on the effects of stimulation.

Yield Stimulation Experiment No. 1, 1927 Clearing, Nivitigalakele:

The results of yield stimulation depend largely on the type and condition of the rubber material which is treated. For this reason it is difficult to generalize on the results of any particular experiment.

Eighteen local clones were included in this experiment. These budded trees are some of the oldest in Ceylon and the 30-year-old trees are as big as well grown old seedling trees.

This 1927 area gave yields of 1,000 lb. dry rubber per acre per year on 133% intensity tapping during the last war. In recent years it has been yielding about 600 lb. per acre per year.

All trees were initially tapped from 1955 on a ladder cut tapped downwards and the yields were increased to 812 lb. per acre per year but in 1956, when the high cuts approached the junction of virgin and renewed bark, the yields fell sharply to 600 lb. per acre per year. Comparable half-tasks were then treated with "Dilatex," a yield stimulant with 2, 4, 5-T as the active ingredient, and the 1st and 2nd six-monthly applications on a 3-inch wide strip of scraped bark below the cut resulted in an increased yield of 51.3 per cent from March, 1957, to February, 1958.

It was found that a yield stimulant of thick consistency is more effective with deep scraping which, under our wet climatic conditions, leads to certain undesirable features.

An experiment with lighter scraping of a 2-inch wide strip of bark gave lower increased yields.

Breeding and Selection:

The work in connexion with the above has been handed over to the Plant Breeding Section of the Botany Department as from August, 1958.

The Plant Breeder, assigned to this Institute in 1958 through the "Technical Aid Program" of the U.S. Operations Mission to Ceylon, submits a separate report for 1958.

The work of this Section combines the breeding for resistance to Oidium heveae, which has been already initiated by the Botany Department, with the breeding for resistance against Phytophthora and Dothidella leaf diseases.

Performance of Local Clones and Clonal Seedlings:

The summary of results of the test tapping of clonal seedlings is largely restricted to seedling families which are of commercial importance. Clone PB 86 was selected for hand-pollination work in the early years, because of its high yielding characteristics and prolific seeding qualities. Its susceptibility to Phytophthora diseases showed up when effective Oidium control resulted in heavy fruit set. The seedlings of PB 86 crosses have not, however, shown a high susceptibility to Phytophthora diseases in our experimental plantings.

Selfed seed of clone PB 86 have been definitely unreliable for producing high yielding trees but crossed seeds of clone PB 86 with reliable clonal parents have produced clonal seedlings which have given very promising yields without any selective thinning. Such seed are available on estates as mixed seed along contact belts of clone PB 86 with other high yielding clones. The yields recorded over a number of years of tapping support the reliability of PB 86 crossed seed. These yields, after selective thinning, should compare favourably with those of high yielding clones.

Yields of Clonal Seedling Families in lb. per tree per year
Tapped S/2, d/2, 100%

Year of planting	Family: Female parent	Male parent	No. of trees tapped	Age in Years: 11th	12th	15th	16th	17th
1941	RRIC 8	× Mil 3/2	45–40					16.9
	,,	× Wag 6278	39–38					21.5
1942	RRIC 8	× Hil 28	125–123				16.0	
	,,	× Tjir 1	84–83				21.7	
1943	PB 86	× PR 107	22			20.7		
	,,	× Tjir 16	14			16.7		
	,,	× Tjir 1	25			15.7		
1946	PB 86 H.P. Crosses		91		15.0			
1946	PB 86 H.P.	,,	144		14.4			
1947	PB 86 H.P.	,,	665	11.9				
	Tjir 1 H.P.	,,	267	10.3				
	Tjir 1 selfed seed		316	6.0				

Yields of RRIC Clones established from Hand-Pollinated Seedlings:

The yields of the best yielding RRIC clones in 1958 are given overleaf. Three-tree or five-tree clones of the original budgrafts are test-tapped. Some of the clones have been tapped on reduced numbers due to losses of trees from disease and wind damage. Clone RRIC 28 has only one tree left in tapping which shows symptoms of Brown Bast. It has given 51.9 lb. dry rubber per tree per year. The clone is nevertheless inherently high yielding. The final assessment of these high-yielding RRIC clones for secondary characteristics must be made from observations in large scale clone trials.

Yields of selected RRIC Clones in 1958 in lb. per tree per year

Tapped S/2, d/2, 100%

Clone	Year of planting	Year of Tapping							
		5th	6th	7th	8th	9th	10th	11th	12th
RRIC 13	1941								24.6
17	,,								24.2
51	,,								23.4
9	,,								21.2
28	1944				51.9				
41	,,				44.2				
45	,,				43.1				
31	,,				33.6				
39	,,				30.3				
42	,,				30.2				
60	,,				28.1				
59	,,				26.9				
75	1943				41.4				
76	,,				40.2				
79	,,				31.1				
36	,,				30.6				
35	,,				28.7				
50	,,				28.4				
33	,,				27.4				
37	,,				27.3				
47	,,				27.2				
54	1946		25.9						
55	,,		20.0						
64	1947	29.3							
78	,,	25.2							
65	,,	22.3							

Clones established from Old Seedling Mother Trees:

Clone RRIC 1 was established from an old unselected seedling mother tree on a commercial estate. It is yielding 16.6 lb. dry rubber per tree per year in the 12th tapping year. In the large-scale clone trial at Hedigalla the clone shows a leaning habit of growth.

Clone Nab 15 was established from a Tjikadoe seedling on Nabunnatenne Estate. In the 13th year of tapping it has given 17.6 lb. dry rubber tree per year. It is the best in the Nab series for yield and secondary characters.

Clones RRIC 2 to 7:

These clones were established from high yielding PBIG seedlings in 1934. Clones RRIC 5 and 7 are yielding 15.0 and 17.0 lb. dry rubber tree per year in the 6th tapping year respectively. The latter clone is outstanding. These clones are among the better growing clones in the 1953 large-scale clone trial at Hedigalla.

Clone RRIC 52:

This clone was established from a Tjikadoe seedling in 1944. It is the most vigorous growing clone in our clearings and the four original budgrafts have given an average of 34.5 lb. dry rubber tree per year in the 8th year of tapping. It is, however, only moderately high yielding in the early years and depends on its girth for high yields in later years.

Foreign Clones:

Clone PB 86 is still outstanding in yield in most of our clone trials, where it is used as a control.

Clone (*Chemara*) Ch 26 has given 10.6 lb. dry rubber tree per year with clone PB 86 giving 8.2 lb. per tree under comparable conditions in the second tapping year. The clone is known to be susceptible to wind damage in Malaya.

The yield results of clones AVROS 255, RRIM 501 and 513, PR 107, LCB 1320 justify their inclusion in our planting recommendations.

Wide Avenue Systems of Planting:

Thirty-one clones were planted on a wide avenue system spaced 6′×45′ with 6 replications of 25 tree plots of each clone. The yields of the better known clones in the third tapping year are presented below.

Wide Avenue Planting 6′×45′, 1949 Clearing, Hedigalla
First tapped on S/2, d/3, 67% in July, 1956

Clone	No. of trees tapped 1958	Yield in lb. d.r. per tree per year
PB 86	139	7.6
RRIM 513	138	7.0
RRIM 501	132	6.9
Nab 20	138	7.7
RRIC 52	139	5.1

Due to the presence of clone LCB 870 in Hedigalla which is now heavily attacked with Phytophthora diseases during the susceptible season, several clones in the 1949 avenue planted area were infected with Bark Rot in 1958. Clone RRIC 52 was only mildly affected in this planting. No wind damage cases have been reported in this area.

Crown Budding Experiments:

Due to the extremely low yielding qualities of the Oidium-resistant clone LCB 870, and its high susceptibility to Phytophthora diseases, it is unlikely that crown budding with this clone will be adopted on a commercial scale in the future. In the meantime some of the crown budding experiments will be continued for further information on the effects of low yielding crowns on high yielding centre sections.

In the 1952 large-scale clone trial at Dartonfield with clones PB 86, RRIM 501, Nab 12, 15 and 20, half-plots of each clone were crown budded at a height of 8 feet with clone LCB 870. The trees not crown budded were taken into tapping in 1958. The crown budded trees are still 3.4 inches behind in girth in 1958; these trees will be tapped in 1959. Any serious set-back in yield due to the low yielding crowns of clone LCB 870 could be finally assessed in this experiment.

A large-scale crown budding experiment at Hedigalla with high-yielding and low-yielding clones used as centre sections and crowns in a balanced layout indicate that the yields of the centre sections can be affected by the inherent yielding qualities, the foliage spread and density of the crown.

In 108 comparisons there is no marked effect on the centre section from crown budding at heights of 5 feet and 8 feet from ground level.

Growth Measurements in Immature Areas:

Girth measurements are taken of trees in immature areas which have completed two years' growth. In 1958 there were 446 acres of such areas in Nivitigalakele and Hedigalla. In these large-scale clone trials it is only possible to take measurements on every 5th or 10th tree permanently marked for annual girth measurements.

All the areas are new plantings in virgin jungle which have generally shown poor soil conditions compared with good replanted land on commercial estates.

A severe set-back in growth rate has been recorded in certain areas on Hedigalla Division in the first 3 years of growth. In the 4th year there is a general recovery in the rate of growth, with yearly increment figures above average expected standards of growth, due to decaying timber, the return to the soil of leaf mould of vigorous growing ground covers and systematic manuring with RRIC mixtures.

A summary of girth increment figures for 1957/58 is given below:—

Clearing	Clones	Range of girth increments in inches 1957/58
1953, 10 acres, Nivitigalakele ...	RRIC 44, 45, PB 86	3.4 to 4.1
1954, 10 acres, ,, ...	PB clones, RRIM 501 IRCI 7 and 10	4.2 to 5.1
1952, 25 acres, Hedigalla ...	625 five-tree clones	— 4.2
1953, 114¾ acres ,, ...	(*a*) RRIC 1 to 7	3.8 to 4.5
	(*b*) 8 high yielding foreign and local clones	3.1 to 4.4
1954, 148 acres ,, ...	RRIC 16 to 37 PB 86, and PR 107	2.5 to 4.6
1955, 78 acres ,, ...	RRIC 9, 11, 12, 13, 14, 40, 41, 43, 46, 47, 49 and 50	2.3 to 4.3

The girth development is dependent to a large extent on the inherent vigour of individual clones.

Replanting in 1958:

A large-scale clone trial was planted on a commercial estate in the Matugama district during the South-West planting period of 1958. Thirty one acres were planted with the following clones, with 300 trees of each clone to serve as a tapping task in later years:—

Clones GT 1, AVROS 385 and 427, IRCI 2 and 6, RRIM 605 and 607, RRIC 22, 28, 41, 45, 36, 37, 39, 54, 55 and 52.

Four control 300-tree blocks of clone PB 86 completed the layout.

A manurial experiment has been superimposed in a section of this clone trial.

DETAILED REPORT

Staff:

Mr. C. A. de Silva, Botanist, continued to act for the Director in 1958 up to the 26th of February. The Director resumed duties on 27th February on his return from overseas leave. The Botanist reverted to his substantive post for the remainder of the year under review.

Mr. W. E. Manis, Plant Breeder, was assigned to the Institute through the " Technical Aid Program " of the U.S. Operations Mission to Ceylon. He took charge of the Plant Breeding Section in July, 1958.

Mr. D. M. Fernando, Assistant Plant Breeder, was on duty throughout the year. He worked under the Plant Breeder from July, 1958.

Mr. L. B. Chandrasekera successfully completed his post-graduate course at Cambridge University and resumed duties as Research Assistant in August, 1958.

Mr. W. G. V. Fernando, Senior Technical Assistant, was on duty during the year 1958.

Mr. C. Amaracone, Technical Assistant, was on duty at Nivitigalakele Estate.

Advisory Work:

The advisory correspondence of the Botany Department has been considerably reduced in recent years due to the propaganda work carried out by the Smallholdings Department, both in new planting and replanting work. The Government Rubber Replanting Subsidy Scheme has also increased the circulation of information on planting material and methods of cultivation. The Botany Department has made substantial initial contributions to the information included in the circulars issued by these departments.

The writer has been called upon to visit Colonization Schemes in the Moneragalla and Hedigalla areas initiated and supervised by the Government Agents and District Land Officers. Reports have been submitted to the Land Commissioner and Government Agents.

The correspondence of the Botany Department has been mostly concerned with planting material for replanting programmes and high intensive tapping for obtaining increased yields from old rubber areas.

A general talk on rubber cultivation was given to trainee Rubber Instructors of the Smallholdings Department who visited the Institute's headquarters at Dartonfield on the completion of their course of training.

Correspondence:

Inward	... ...	239
Outward	... ...	217

Leave:

Casual	... ...	18½ days
Vacation	... ...	24 ,,
Sick ...	... ...	17½ ,,

Visits:

(1) Experimental Stations and Estates 48.

(2) Twelve visits were made to Colombo in connection with meetings, despatches and importation of budwood and meeting a newly appointed staff officer on arrival from overseas.

(3) Two visits were made to the Department of Agriculture, Peradeniya, in connexion with the export of budwood.

Meetings:

The writer attended the following meetings in his capacity as—

(*a*) *Acting Director:*

Rubber Replanting Advisory Board meetings	...	5
Salaries Committee meetings	...	1
Administrative Committee meetings	...	1

(*b*) *Botanist:*

District Planters' Association meetings	...	3

Publications and Lectures:

(1) Advisory Circular No. 60, Sale of Budwood.

(2) "Soil Conservation Drainage and Holing" in the Combined 1st and 2nd Quarterly Circulars for 1958.

(3) A lecture on Planting Material was given at a meeting of the Kelani Valley Planters' Association.

Tapping Experiments:

Two preliminary experiments were initiated to study the economics of obtaining increased yields from high tapping on virgin bark of low-yielding old budded rubber, with and without the application of yield stimulants.

Unfortunately the Institute has no old seedling rubber left for experimentation. Old seedling rubber on most estates is generally well over forty years of age. In many cases where the tapping intensity is over 200 per cent bordering on methods of slaughter tapping the use of stimulants is clearly uneconomical.

Old seedling rubber tapped at 133 per cent intensity with reserves of virgin bark for high cuts can be exploited economically for increased yields with the use of yield stimulants. It is possible that in isolated cases useful increased yields can be obtained from applications to cuts on renewed bark if the tapping intensity is not over 200 per cent. This can be done for about two years before uprooting; this is an alternative to slaughter tapping.

Tapping experiments carried out in Malaya generally support the above comments.

Trials with Upward Cuts in Virgin Bark on Budded Rubber, 1935 Clearing, Nivitigalakele:

This experiment is located in an area planted with 40 local clones in 25-tree plots. All these clones have been discarded from our final selections and yields of

about 600 to 700 lb. dry rubber per acre per year, were obtained prior to the initiation of this experiment.

Layout and Preliminary Results:

Three tapping tasks were used in half tasks balanced for preliminary yielding capacity, by test tapping the half tasks from April to June, 1958, before the application of the treatments. The half tasks were also balanced for the 40 clones by dividing each 25-tree clone into two sub-plots of 12 and 13 trees each.

It is essential to have the initial yields balanced before any differential response can be assessed accurately. Alternatively, the final treatment yields must be adjusted for initial differences by means of a regression, which is the more laborious procedure.

The treatments were as follows:—

(*a*) Upward tapping a half circumference 'V' cut just above the normal tapping panel; the V cut was shaved outwards on a new method of tapping upwards with the Michie-Golledge knife.

(*b*) The control was a half-spiral cut tapped downwards on renewed bark on the normal tapping panel.

The cuts in (*a*) and (*b*) were tapped on alternate days at 100 per cent intensity. These treatments were introduced in 1958, and the results from August, 1958, to December, 1958, given below are based on experimental yields taken on all normal tapping days.

1958 Upward Tapping Experiment, 1936 Clearing, Nivitigalakele, Yield in lb. dry rubber

Tapped V/2, d/2, 100%

Period	Upward tapping on virgin bark	Normal downward cuts on renewed bark (Control)
Preliminary tapping April to June, 1958	519.29	519.32
August 1958	161.1	127.2
September ,, ...	343.8	225.9
October ,, ...	200.4	140.6
November ,, ...	419.8	288.0
December ,, ...	479.0	311.8
Total	1604.1	1093.5
Increase	510.6(46.7% over control)	

The upward cuts have given an increased yield of 46.7 per cent over the control in the first five months of experimental tapping.

Tapping upward cuts calls for a 40 to 50 per cent reduction in the size of the task per tapper. This extra cost can be offset by using a yield stimulant on the upward tapped bark. The next experiment gives the effect of yield stimulants on high cuts in virgin bark.

Yield Stimulation Experiment (No. 1), 1927 Clearing, Nivitigalakele:

The results of yield stimulation depend largely on the type and condition of rubber trees which are treated. For this reason it is difficult to generalize on the results of any particular stimulation experiment.

This experimental area was originally planted with monoclonal blocks of local clones established from high-yielding estate mother trees. About 18 clones were included in this experiment with the number of trees of each clone ranging from 7 to 87. These budded trees are some of the oldest in Ceylon.

None of the clones in this area has been selected for large-scale commercial planting. During the last world war these trees were tapped on 2S/2, d/3, 133%, and yields of 1,000 lb. dry rubber per acre per year were obtained.

In more recent years the yields dropped to about 600 lb. per acre per year, and a decision was made to try out high ladder V cuts on a half circumference tapped downwards on alternate days for improving the yields.

These high ladder cuts were introduced in 1955 at a height of 6 feet from ground level. The yield for 1955 was 815 lb. dry rubber per acre per year. In 1956 the yields fell sharply again to the 600 lb. per acre level, partially due to the previous tapping history of these old trees and to the area of latex extraction overlapping the renewed bark of the normal tapping panel.

The present experiment commenced in 1957, with the application of "Dilatex" as a yield stimulant on half-tasks. The active stimulating ingredient is 2, 4, 5-T.

The Layout and Preliminary Results:

The tapping task on ladder cuts is approximately half the size of a normal tapping task on a single half spiral cut, depending on the terrain of the land.

To reduce uncontrolled errors to a minimum each clone was allocated in equal numbers to the half-tasks.

Before introducing the two treatments consisting of the control and yield stimulation, the half-tasks were test tapped for their initial yielding capacity. The two treatments were then allocated to balance the initial yields in the comparable pairs of half-tasks.

The applications of "Dilatex" were made below the "V" cut along a scraped 2-3 inch wide strip of bark once in 6 months. The preliminary results are presented below:—

Yield Stimulation Experiment, 1927 Clearing, Nivitigalakele Tapping System, High Cuts with Ladder V/2, d/2, 100% Experimental tapping on all normal tapping days

Period of Yield Recording	Half-task A (Dilatex)			Half-task B (Control)			Yield increase in lb.	Increase per cent
	No. of trees	No. of tappings	Yield in lb. d.r.	No. of trees	No. of tappings	Yield in lb. d.r.		
Initial yields Sept. '56 to Jan. '57	342	5	760.7	342	5	760.4		
After 1st Application Mar. '57 to Sept. '57	342	45	1352.2	342	45	852.9	499.3	58.5
After 2nd Application Sept. '57 to Feb. '58	342	35	1109.6	342	35	774.6	335.0	43.2
					Increase per cent 1957/58			51.3
After 3rd Application Opposite panel Mar. '58 to Aug. '58	328	26	961.9	338	26	695.1	266.8	38.4
After 4th Application Sept. '58 to Dec. '58	303	26	786.7	314	26	654.2	132.5	20.3

(To be continued)

The above results generally indicate that even 30-year old budded rubber can give substantial increases in yield from stimulation of high cuts in virgin bark.

The reduction of trees after the third application was due to root diseases and wind damage in this old clearing.

The reduction in numbers of trees after the fourth application was due to the drying out of the tapping cut.

Breeding and Selection Work:

The work under the above heading has been, since 1957, concentrated on hand-pollination programmes for the purpose of establishing and selecting high-yielding clones resistant to diseases, which at the present time call for expensive methods of control.

Clone LCB 870, which is low-yielding and resistant to Oidium heveae, has been used for crossing with high-yielding local and foreign clones since 1951 by the Plant Pathology Department. A considerable amount of this material both as H.P. seedlings and derived clones have now accumulated in various clearings for testing in collaboration with the Botany Department.

Future investigations in connexion with the selection of clones for high yields and resistance to Oidium, together with new breeding work for developing clones resistant to Phytophthora and Dothidella diseases, will be carried out under the supervision of the Plant Breeder assigned to this Institute by the U.S. Operations Mission to Ceylon.

This officer assumed duties in July, 1958, and has commenced work in the Plant Breeding Section of the Botany Department. He submits a separate report for 1958.

Test Tapping of Clones and Clonal Seedlings:

The test tapping of H.P. clonal seedlings in various clearings was further restricted in 1958. Table I gives the yields of seedling families, which may be represented in mixed seed collected from registered seed gardens on commercial estates. Crosses with clone PB 86, Tjir 1, Tjir 16 and Glen 1 are the most probable types to be found in areas approved for collections of mixed clonal seed on commercial estates.

It is interesting to note that the yields of PB 86 crossed seedlings, which include the better known clonal seed parents, are quite promising. It is known, however, that "selfed" seed of clone PB 86 is unsatisfactory for planting as clonal seedlings. Many areas planted with this type of seed have failed to come up to expected standards of high yields per acre.

Although it is easier to distribute stumped clonal seedling than budded stumps in rehabilitation schemes which supervise the replanting of old rubber areas, the selective thinning out of high initial stands of the more variable seedling material calls for some agricultural knowledge. For this reason clonal seedlings in replantings of the small and middle-class owners may not, in most cases, come up to the standards of yields of budded rubber. There is little doubt, however, that the correct types of clonal seedlings with selective thinning on early growth and later yield characteristics can give yields per acre which compare very favourably with those from budded rubber areas.

A summary of the yields of clonal seedling families in test tapping is given in Table I. It should be noted that the yields obtained from clonal seedlings are based on average yields without selective thinning out of the poorest yielding trees on our experimental field trials.

The test tapping of clones, established from H.P. seedlings obtained from pollination programmes carried out from 1939 to 1944, has been further reduced in 1958. It is now possible to summarize the yield results of the best yielding clones in a single Table II, which gives the necessary information for following the yield trends of the final selection of high-yielding clones; the budwood of a number of these clones has been distributed to commercial estates for clone trials on a small scale.

The Institute has planted most of the clones in large-scale clone trials of approximately 5 acres of each clone since 1954. Up to the end of 1957 there were approximately 300 acres of the RRIC clones planted on our Hedigalla Estate.

The number of original budgrafts test tapped in each clone range from 5 to 1. Some of the yields of over 40 lb. dry rubber per tree per year are due to reduced number of trees per clone in tapping. Clone RRIC 28 has given a yield of 51.9 lb. per tree per year in 1958 with a single tree in tapping, due to the loss of two trees from wind damage in a rather exposed area. It is worth including this clone in small-scale trials on estates.

There are, however, a number of clones with the full complement of original trees on test, which have given outstanding yields. These clones should be given preference in a short list for trial in tapping tasks in clone trials on commercial estates. The age of the trees up to 1958 can be easily calculated from the year of planting given in column 3, Table II.

Trials of H.P. Seedlings and Derived Five-Tree Clones on Outside Estates:

The test tapping of the H.P. seedlings and five-tree clones on 9 outside estates will be discontinued from 1959 except for the further testing of a few selected RRIC clones. The field personnel used for recording yields once a month will be employed to develop the large-scale clone trials on commercial estates planted in 1957 and 1958. Summaries of the yield results are presented in Tables III and IV.

Some of the yields of selected clones are quite promising. These will be included in large-scale clone trials, which will be initiated in our sub-stations. We are at present negotiating for the acquisition of suitable blocks of about 200 acres each of old rubber land on commercial estates, for sub-stations in three rubber planting districts.

The yields of clonal seedlings in Table IV show promising yields for crossed seedlings of clone PB 86. The figure of 13.6 lb. dry rubber per tree per year on 320 trees, without selective thinning of the poorer trees, confirms our finding in the earlier trials of PB 86 crosses.

TABLE I

Test Tapping Results of Hand-Pollinated Clonal Seedlings

Tapped on S/2, d/2, 100%

RRIC Station	Origin of material	Year of planting	Seedling Parentage	No. of trees tapped 1958	Yield in lb. d.r. per tree per year		No. of trees		
					1957	1958	Canker and Bark Rot	Brown Bast	Wind damage
Nivitigalakele	1939 H.P. Seedlings	1941	RRIC 8 × Mil 3/2	45–40	14.8	16.9	9	15	1
			,, × Pil A 44	37–36	10.6	10.2	2	9	—
			Pil A 44 × Wag 6278	17	10.2	10.7	3	1	—
			RRIC 8 × Wag 6278	39–38	19.7	21.5	2	10	2
			Pil A 44 × RRIC 8	14	7.2	7.6	2	6	—
			Control Wag 6278 (budded)	40	14.1	14.6	1	3	1
Nivitigalakele	1940 H.P. Seedlings	1942	RRIC 8 × Hil 28	125–123	12.3	16.0	2	24	3
			,, × Tjir 1	84–83	15.6	21.7	1	23	13
Hedigalla	1941 H.P. Seedlings	1943	PB 86 × PR 107	22	21.0	20.7	4	4	—
			,, × Tjir 16	14	17.5	16.7	1	1	—
			,, × Tjir 1	25	15.3	15.7	—	4	—
			Control Wag 6278 (budded)	24	16.4	11.7	—	2	—
Hedigalla	1943 H.P. Seedlings	1946	PB 86 Crosses	91	14.4	15.0	19	—	—
			Control Tjir 1 (budded)		12.8	12.3	3	—	3
Hedigalla	1944 H.P. Seedlings	1946	PB 86 Crosses	144	13.4	14.4	4	3	1
Hedigalla	1945 H.P. Seedlings and clonal seedlings	1947	PB 86 Crosses	665	10.9	11.9	22	14	1
			Tjir 1 ,,	267	9.1	10.3	10	10	—
			Tjir 1 Selfs	316		6.0	15	1	1

TABLE II

Test-Tapping Results of Clones Established from Hand-Pollinated Seedlings

Tapped S/2, d/2, 100%

R.R.I.C. Station	Origin of material	Year of planting	Clone	No. of trees tapped	Parentage of seedling mother tree	Yield in lb. d.r. per tree per year			No. of trees		
						1957	1958	Control Wag 6278	Canker and Bark Rot	Brown Bast	Wind damage
Nivitigala-kele	Clones established from 1939 H.P. seedlings	1941	RRIC 13	4–3	RRIC 8 × Mil 3/2	29.8	24.6	19.7	—	*2	—
			,, 17	3	,, × ,,	19.1	24.2	20.6	2	2	1
			,, 51	5	,, × ,,	22.3	23.4	10.7	1	*1	—
			,, 9	4–3	,, × ,,	27.4	21.2	11.8	—	1	—
			,, 16	4	,, × ,,	23.9	18.0	13.4	—	3	—
			,, 22	2–0	,, × Wag 6278	32.2	16.4*	15.5	—	1	4
							*Tapped	from	Jan. to	April	
Nivitigala-kele	Clones established from 1940 H.P. seedlings	1944	RRIC 28	1	RRIC 8 × Hill 28	36.0	51.9*	20.4	—	1	2
			,, 41	2	,, × Tjir 1	37.0	44.2	15.3	—	2	—
			,, 45	3	,, × ,,	41.2	43.1	21.1	1	—	—
			,, 31	3	,, × ,,	28.8	33.6	18.1	1	—	—
			,, 39	2	,, × ,,	25.8	30.3	19.2	—	—	1
			,, 42	1	,, × ,,	21.8	30.2	13.6	—	1	—
			,, 60	3	,, × Hill 28	23.7	28.1	21.4	—	2	—
			,, 59	3	,, × Hill 28	25.8	26.9	24.0	—	—	—
							*One	tree w	ith Bro	wn Bas	t
Hedigalla	Clones established from 1941 H.P. seedlings	1943	RRIC 75	3	RRIC 8 × Tjir 16	32.3	41.4	—	—	—	1
			,, 76	4	TKD 113 × RRIC 8	26.5	40.2	—	—	—	—
			,, 79	5	PB 86 × M 162	26.0	31.1	—	—	—	—
			,, 36	3	,, × PR 107	27.3	30.6	—	—	—	1
			,, 35	5	,, × ,,	21.3	28.7	—	—	—	—
			,, 50	4	Tjir 1 × PB 86	18.3	28.4	—	—	—	—
			,, 33	5	RRIC 8 × Dal 5315	23.4	27.4	—	1	—	—
			,, 37	4	,, × Diy 1	28.8	27.3	—	—	—	—
			,, 47	4	Diy 1 × Mil 3/2	30.5	27.2	—	—	—	—
			,, 38	4	PB 86 × PR 107	18.2	25.2	—	2	—	—
			,, 46	3	,, × ,,	29.0	21.7	—	—	—	—
			,, 74	2	,, × ,,	30.9	20.4	—	2	—	—
			,, 32	5	RRIC 8 × H 24	20.4	19.9	—	—	—	—
Hedigalla	Clones established from 1943 H.P. seedlings	1946	RRIC 54	5	PB 86 × Wag 6278	21.3	25.9	—	—	—	—
			No. 229	5	,, × RRIC 8	17.1	22.8	—	—	—	—
			No. 299	5	,, × Mil 3/2	20.0	22.1	—	—	—	—
			RRIC 55	5	,, × Wag 6278	16.5	20.0	—	—	—	—
			,, 57	5	,, × RRIC 8	18.8	19.4	—	—	—	—
			No. 258	5	,, × ,,	18.0	19.2	—	—	—	—
			RRIC 62	4	,, × ,,	15.4	16.4	—	—	—	—
Hedigalla	Clones established from 1944 H.P. seedlings	1947	RRIC 64	5	PB 5/139 × TKD 113	21.2	29.3	—	—	—	—
			,, 78	5	,, × ,,	23.3	25.2	—	—	—	—
			No. 17	5	,, × ,,	16.1	23.2	—	—	—	—
			RRIC 65	5	,, × ,,	18.3	22.3	—	—	—	—
			No. 136	5	,, × ,,	15.9	19.8	—	—	—	—
			,, 109	5	,, × ,,	18.5	19.6	—	—	—	—
			,, 293	5	PB 86 × PB 5/60	15.6	17.7	—	—	—	—
			,, 134	5	PB 5/139 × TKD 113	16.4	17.4	—	—	—	—
			,, 56	5	,, × ,,	17.3	16.8	—	—	—	—
			RRIC 66	5	,, × ,,	15.2	15.0	—	—	—	—
			,, 63	5	,, × ,,	12.3	14.1	—	—	—	—

TABLE III

Results of Five-Tree Clones Established from 1945 H.P. Seedlings on Commercial Estates

Tapped S/2, d/2, 100% in 1958
† Tapped S/2, d/3, 67%

Clone	Parentage of Seedling Mother Tree	No. of trees tapped 1958	Yield in lb. d.r. per tree per year				
			1954	1955	1956	1957	1958
RRIC 69	PB 86 × RRIC 7	4	19.3	16.7	19.7	26.6	24.3
No. 243	,, × AVROS 157	5	—	17.6	20.8	20.8	22.5
RRIC 72	,, × RRIC 7	5	13.5†	10.3†	9.2†	18.0	21.7
RRIC 68	,, × RRIC 4	3	17.5	19.8	20.1	24.4	21.5
No. 158	,, × RRIC 7	5	—	—	13.4†	20.7	21.5
RRIC 70	,, × ,,	3	22.9	19.5	16.5	17.8	21.5
No. 293	,, × ,,	3	9.8†	11.1†	12.8†	19.0	20.2
RRIC 73	,, × ,,	4	13.1†	16.0†	15.6†	18.6	19.0
No. 275	PB 86 × RRIC 5	5	—	10.0†	20.2	19.4	17.7
RRIC 83	PB 5/139 × RRIM 513	3	11.7†	13.1†	17.2	21.6	17.1
RRIC 81	PB 86 × RRIC 7	5	14.8	20.9	17.0	17.2	15.7
RRIC 84	,, × ,,	5	8.6†	12.6	16.3	17.7	12.8

TABLE IV

Results of 1945 H.P. Seedlings Planted on Commercial Estates
Yield in lb. Dry Rubber per Tree per Year

Tapped S/2, d/2, 100%

Family	No. of trees tapped 1958	1954	1955	1956	1957	1958
PB 5/139 crosses ...	373	9.8	11.0	10.3	13.4	12.1
PB 86 crosses ...	320	9.1	11.0	11.8	12.2	13.6
AVROS 163 crosses ...	68	—	6.0	6.3	6.6	7.5
RRIM 514 × BR 2 ...	15	—	9.4	9.1	6.5	8.2
Total ...	776					
Mean Yields ...		9.5	10.8	10.6	12.2	11.5

The Selection of Foreign Clones and Local Clones established from Imported Clonal Seedlings:

The test tapping of the above clones, most of which have been recommended for planting on a commercial scale, have been continued in 1958. Tables V to XI present the yield results and important secondary characters for the last three years of tapping.

The fluctuations in yields from year to year are partially due to the fact that the tapping cuts are changed over from one panel to the other each year, after three years of preliminary tapping on the first panel.

Large-Scale Clone Trial, 1952 Replanted Area, 34½ Acres, Dartonfield:

In this trial, clones Nab 12, 15, and 20 with clones PB 86 and RRIM 501 are planted in 200-tree plots replicated fourfold. 100 trees in each plot were crown-budded with the Oidium-resistant clone LCB 870, which is extremely low yielding. Due to the crown-budding at 2 years of age these 100-tree plots are one year behind in growth.

The 100-tree plots not crown budded were taken into tapping in April 1958. Forty-tree plots were marked out centrally for a study of the early yields of the five clones. The yield results from April to December, 1958, based on one test tapping per month are given in Table V.

TABLE V

Large-Scale Clone Trial, 1952 Replanted Area, Dartonfield
Tapped S/2, d/3, 67% from April, 1958
Yield in gms. per tree per tapping

Clone	No. of trees tapped	Yield April to Dec., 1958
Nab 15 ...	160	25.3
RRIM 501 ...	160-133*	22.3
PB 86 ...	120*	21.1
Nab 20 ...	160	20.0
Nab 12 ...	160	13.4
Mean ...		20.4

*Trees taken out for building sites.

The early yields of clone Nab 12 are disappointing, but it may be a little premature to comment on its yields at this stage. It is a slow starter and has given promising yields in earlier trials.

Nab Clones:

Test tapping has been continued on four Nab clones from the original 21 clones established from Tjikadoe seedlings. The results are summarized in Table VI.

TABLE VI

1939 Clearing, Nivitigalakele
Trees tapped on S/2, d/2, 100% from 1945

Clone	No. of trees 1958	Yield in lb. d.r. per tree per year			Bark Rot and Canker cases	Brown Bast cases	Wind damage cases
		1956	1957	1958			
Nab 12	18	15.9	18.3	15.7	2	5	1
Nab 15	18	15.7	15.0	17.6	3	4	—
Nab 17	17	16.7	17.4	21.1	—	10	2
Nab 20	9	16.2	15.3	13.9	—	7	7
Control PB 86	19	17.3	20.9	19.1	—	4	—

Clone PB 86 in this clearing is free of Bark Rot, Canker and Phytophthora leaf fall to which it is susceptible in wetter areas. Nab 17 is not generally recommended because of the early indications of a high incidence of Brown Bast. The yields of clone Nab 20 have deteriorated owing to wind damage on a number of trees in a somewhat exposed area.

TABLE VII

Clone Trial 1940 Clearing, Nivitigalakele

Tapped S/2, d/2, 100% from January, 1947

Clone	No. of trees 1958	Yield in lb. d.r. per tree per year			Brown Bast cases	Bark Rot and Canker cases	Wind damage cases
		1956	1957	1958			
RRIM 501 ...	12	12.6	12.5	13.7	8	1	6
PB 6/50 ...	11–12	16.0	18.5	20.5	6	1	2
AVROS 352 ...	12	13.7	11.6	16.5	13	2	6
PR 107 ...	11–12	14.3	12 6	16.0	4	8	2
RRIM 513 ...	12	10.6	12.1	12.1	4	2	—
AVROS 255 ...	12	19.4	15.1	18.6	9	—	6
War 4 ...	11–12	14.9	16.0	18.3	4	4	—
RRIC 1 ...	12	13.4	13.8	16.6	6	3	—
Lun N ...	12	13.5	11.7	15.9	5	1	2
Control Tjir 1 ...	10–12	16.1	14.0	18.8	8	1	2

The 1940 clearing is located in a very steep and rocky area of 10 acres in an exposed area. The clones have been given a severe test.

TABLE VIII

Large-Scale Clone Trial, 1946, 21 Acres, Nivitigalakele

Tapped S/2, d/3, 67% from 1953
Tapped S/2, d/2, 100% from 1956
Yield in lb. d.r. per tree per year

	AVROS 255	AVROS 352	PB 6/9	PB 6/50	LCB 1320	CHM 3	Tjir 1	PR 107
No. of trees 1958 ...	269–277	235–250	298–299	301–304	288–292	253–274	247–255	297–299
Yield 1956 ...	13.7	8.7	12.6	14.6	12.4	13.5	9.7	9.8
,, 1957 ...	14.3	9.2	11.4	12.8	11.8	12.5	9.9	10.6
,, 1958 ...	15.2	12.1	11.5	13.1	13.9	15.2	12.5	12.6
Brown Bast cases ...	29	6	41	17	16	19	14	14
Canker cases ...	4	7	—	2	1	1	1	23
Wind damage cases ...	37	66	10	15	24	56	40	14

A part of the 21 acres of this clearing is directly exposed to monsoon storms, hence the large number of cases of wind damage.

TABLE IX

Small-Scale Clone Trial, 1944 Clearing, Hedigalla
Tapped S/2, d/2, 100% from May, 1951
Yield in lb. d.r. per tree per year

Clone	No. of trees 1958	Yield			Canker cases	Wind damage cases
		1956	1957	1958		
RRIC 52 ...	4	17.7	23.9	34.5	—	1
PB 5/122 ...	5	18.7	21.7	23.5	1	—
PB 6/5 ...	4	18.0	21.6	17.6	—	2
RR 25 ...	4	19.8	20.3	25.0	—	1
Wag 6278 ...	5	11.8	13.5	18.5	—	—

The above selection of clones is tapped in this area for checking the trend of the yields of clone RRIC 52, which is being observed for its vigorous growth and tolerance to both Oidium and Phytophthora diseases. It is late maturing and gives only moderate yields during the early years of tapping.

In the eighth year of tapping clone RRIC 52 has given 34.5 lb. dry rubber per tree per year. This high yield is obtained from the 4 original budgrafts which are the biggest budded rubber trees in our clearings for their age.

In the 1949 clearing planted on the avenue system spaced 6′×45′, 139 trees of clone RRIC 52 have given 5.1 lb. dry rubber per tree per year in the third year of tapping on S/2, d/3, 67%. Clone PB 86 under the same conditions has given 7.6 lb. per tree per year. The tapping system will be changed to S/2, d/2, 100% in 1959 and the further yield trends of clone RRIC 52 will be observed with interest. In the meantime the clone is being used in our breeding work for evolving clones which are high-yielding and resistant to disease.

R.R.I.C. Clones 2 to 7:

The above clones were originally selected from 120 three-tree clones established from high-yielding PBIG seedlings imported in 1934. In the second trial of these clones planted in 1945 at Hedigalla, approximately 75 trees of each clone have been test tapped from 1953. A summary of the results is given in Table X.

TABLE X

1945 Clearing, Hedigalla
Tapped S/2, d/3, 67% from 1953 to 1955
Tapped S/2, d/2, 100% from 1956
Yield in lb. d.r. per tree per year

Clone	RRIC 2	RRIC 3	RRIC 4	RRIC 5	RRIC 6	RRIC 7	Control Tjir 1
No. of trees 1958	71	74	75	75	73	70	72
Yield 1957	10.4	8.1	10.6	12.5	12.5	13.1	11.3
1958	11.6	9.2	13.1	15.0	11.8	17.0	12.8
Canker cases	4	—	—	—	—	5	—
Brown Bast cases	—	—	—	—	2	1	—

Except for clone RRIC 6 the yield results have improved in 1958. Clones RRIC 5 and 7 are particularly promising.

1950 Clearing, Hedigalla :

There are three small-scale clone trials of foreign and local clones in this area. Trial one and two have 25-tree plots of each clone replicated threefold and the third trial has 25-tree plots of each clone replicated fourfold. Clone PB 86 has been used as the control clone in all three trials.

The presence of clone LCB 870 in two of the trials constitutes a source of Phytophthora infection to the other clones in this area. This clone which was found to be resistant to Oidium is very susceptible to Phytophthora pod rot and leaf fall; its prolific seed setting qualities is a contributory cause of the initial Phytophthora infection. It is the poorest yielding clone as indicated in the yield results presented in Tables XI A and C.

The area in which these trials are located has been selected for a special study of the control of Phytophthora in 1959. The clones which have not been infected in this area must be fairly resistant to Phytophthora infection, as the heavy rainfall of about 180 inches per year on Hedigalla Estate does encourage infection in most areas.

It should be noted that clone Ch 26 has given better yields than clone PB 86 for the second year of tapping. Clone PB 86, although badly affected with Phytophthora in trial No. 3, still shows the best yield in the first year of tapping.

Clone Ch 26 has not been included in our more recent recommendations on planting material. This clone is known to be susceptible to wind damage in Malaya and, as there are preliminary indications of this undesirable secondary character in this country, further observations will be necessary before the clone can be considered for commercial planting.

TABLE XI A

Trial No. 1, Chemara Clones

1950 Clearing, Hedigalla

Tapped S/2, d/3, 67% from March, 1957

Yield in lb d.r. per tree per year

Clones	Ch 2	Ch 3	Ch 4	Ch 8	Ch 26	Ch 29	Ch 31	Ch 32	LCB 870	PB 86 Control
No. of trees tapped	66	70	62	52	69	62	58	64	64	65
Yield 1957	3.1	4.2	2.9	3.2	8.1	4.4	4.1	4.8	2.6	6.5
Yield 1958	6.0	7.0	4.9	4.1	10.6	6.7	4.5*	7.0	2.9	8.2

*Tapped up to June, 1958 only; heavily defoliated by Phytophthora.

TABLE XI B

1950 Clearing, Hedigalla
Trial No. 2 Small-Scale Clone Trial
Tapped S/2, d/3, 67% from 1958
Yield in lb d.r. per tree per year

Clones	RR 134	RR* 108	154/ 41N	RR 116	141/ 41N	RR 195	PB 9/82	Dar 34	LCB 870	PB 86 Con-trol
No. of trees tapped	72	63	51	63	62	59	22	39	68	61
Yield 1958	6.9	6.8	6.6	6.0	5.5	5.3	4.7	4.6	2.8	8.3

*One 25-tree plot badly attacked by Phytophthora Bark Rot.

TABLE XI C

Trial No. 3, Small-Scale Clone Trial
Tapped S/2, d/3, 67% from 1958
Yield in lb d.r. per tree per year

Clone	RR 181	RR 52	RR 39	RR 163	RR 53	RR 119	RR 54	RR 38	Dar 33	LCB 870	PB 86 Con-trol
No. of trees tapped	73	34	76	50	26	71	8	41	36	35	59
Yield 1958	5.1	4.8	4.8	4.7	4.4	4.2	4.1	4.0	3.9	3.0	6.6

In trial No. 3 clones OY 1 and RR 43 have not reached tappable girth. The following clones have been badly attacked by Bark Rot :—

Clone	RR 38	One plot	
,,	RR 39	,, ,,	
,,	RR 163	,, ,,	
,,	RR 181	Two plots	
,,	PB 86	,, ,,	
Clone	RR 52	Two plots	
,,	RR 119	,, ,,	
,,	DAR 33	,, ,,	
,,	RR 53	Three plots	
,,	RR 54	,, ,,	
,,	LCB 870	Four plots	

Growth Measurements in Immature Areas :

The growth of both budded and seedling rubber is assessed by taking girth measurements at intervals of approximately twelve months.

The girth at a height of 3 feet above the highest point of the union between scion and stock is taken as the criterion for the growth of clones; the girth of clonal seedlings is taken at a height of 3 feet from ground level.

An average increase in girth of 3 to 3½ inches per year can be considered as normal good growth. In exceptional cases an average increase of up to four inches can be observed in the more vigorous growing clones.

In clonal seedlings, which are genetically dissimilar in growth characteristics, average growth standards can only be obtained by selectively thinning out the poorest growers from initial high stands of seedlings on an acre basis. In later years it is also essential to eliminate the poorest yielders for obtaining yields which can be compared favourably with those obtained from budded rubber.

The selected planting material obtained from hand-pollination programmes carried out from 1939 to 1945 have been planted in clearings from virgin jungle on our Nivitigalakele and Hedigalla estates. This jungle land is much poorer in standards of fertility when compared with rubber replanted land on good commercial estates. The required standards of good growth can only be obtained by intensive systematic cultivation and manuring. In this way virgin land can be brought up to standard after the first three to four years of cultivation; the decay of timber and debris left on the land after three to four years being a strong contributory factor to the fertility of newly cleared jungle land.

The girth measurements taken in 1958 are summarized below :—

Clone Trial, 1953 Clearing, 10 Acres, Nivitigalakele Estate :

This small-scale clone trial with clone PB 86 as a control is a continuation of the large-scale clone trial planted in 1955 at Hedigalla.

Clones RRIC 44 and 45 were budded in the field on two-year-old clonal seedlings from Sorana Estate in 1955. The growth of the two RRIC clones for three years in a somewhat fertile area with vigorous growing selected stocks, is outstanding.

Clone	No. of trees planted	No. of trees	Mean girth in inches		Girth increase 1957/58
			1958	1957	
RRIC 44 ...	708	695	10.4	7.0	3.4
RRIC 45 ...	724	718	11.8	7.7	4.1
PB 86 ...	60	60	16.2	12.5	3.7

It should be noted that budded stumps of clone PB 86 were planted in 1953 with the Sorana seedlings on which the two RRIC 44 and 45 were budded two years later. The control clone PB 86 is, therefore, two years ahead in growth.

Clone Trial, 1954 Clearing, 10 Acres, Nivitigalakele Estate :

This clone trial was planted in May, 1954. There are 200 trees of each clone in 40-tree plots. The girth measurements taken in July 1957 and 1958 are summarized overleaf.

Clones	IRCI 10	IRCI 7	PB T 207	PB 6/5	PB 24/3	PB 28/59	PB 24/51	RRIM 501	Mean
Mean girth in inches 1958 ...	14.5	16.7	15.3	14.8	14.9	16.3	15.0	15.3	15.3
Mean girth in inches 1957 ...	10.3	11.7	10.7	10.1	10.0	11.4	9.9	10.2	10.5
Girth increase 1957/58	4.2	5.0	4.6	4.7	4.9	4.9	5.1	5.1	4.8

The growth of the above foreign clones planted sparsely in pockets of good soil in a rocky area is above the standards of average good growth in this country.

1952 Five-tree Clone Trial, 25 Acres, Hedigalla Estate :

Six hundred and forty five five-tree clones established from a proportion of the 5,000 H.P. seedlings obtained from the 1945 hand-pollination programme are planted in this area. The average girth of the trees in 1958 is 18.0 inches at 6 years of age. The average girth in 1957 was 13.8 indicating a girth increase of 4.2 inches for 1957/58. This area will be ready for tapping in 1959.

1953 Large-Scale Clone Trial, 114¾ Acres, Hedigalla Estate :

Each clone in this large-scale clone trial is replicated five to sixfold in 200-tree plots. The clones were planted in May-June 1953. The experiment affords a reliable comparison of the R.R.I.C. clones 1 to 7 with some of the better known foreign clones planted on a large scale commercially. The presence of clone LCB 870, which is now known to be extremely susceptible to Phytophthora pod-rot and leaf-fall, provides a source of infection to the clones in this area. This unforeseen aspect of the clone trial will be useful for our investigations on the incidence and control of Phytophthora diseases. Hedigalla shows a high rainfall and a high number of wet days for the year which favour the incidence of these diseases.

1953 Large-Scale Clone Trial
Average Girth Measurements in Inches

Clone	Girth 1958	Girth 1957	Increase 1957/58	Clone	Girth 1958	Girth 1957	Increase 1957/58
RRIC 1	13.0	8.7	4.3	LCB 1320	16.8	13.7	3.1
,, 2	15.4	10.9	4.5	Lun N	15.7	11.5	4.2
,, 3	15.0	11.0	4.0	RRIM 501	15.8	11.4	4.4
,, 4	14.2	10.2	4.0	RRIM 513	13.6	10.5	3.1
,, 5	16.4	12.2	4.2	LCB 870	14.1	10.4	3.7
,, 6	13.2	9.3	3.9	Mil 3/2	14.1	10.2	3.9
,, 7	15.7	11.9	3.8	Tjir 1	14.2	10.2	4.0
				Wag 6278	13.8	9.9	3.9
Mean	14.7	10.6	4.1	Mean	14.8	11.0	3.8

The growth of the local clones compare very favourably with that of the foreign and local clones which have been selected for high yields and vigorous growth.

1954 Large-Scale Clone Trial, 148 Acres, Hedigalla Estate:

Clones RRIC 16 to 37 are planted in this area in single monoclonal blocks of 800 to 840 trees of each clone. Clones RRIM 501, PB 86 and IRCI 10

were included as controls. The growth up to the third year was backward. The rate of growth in the fourth year of age is up to the standards of good growth as indicated in the 1957/58 girth increases. Every tenth tree in the large monoclonal blocks is permanently marked for the annual girth measurement. The 1957/58 results are summarized below :—

1954 Large-Scale Clone Trial

Average Girth Measurements in Inches

Clone	Girth 1958	Girth 1957	Increase 1957/58
RRIC 31 ...	11.9	8.2	3.7
,, 22 ...	10.8	7.7	3.1
,, 18 ...	11.5	7.2	4.3
,, 34 ...	10 6	6.8	3.8
,, 35 ...	10.7	6.6	4.1
,, 36 ...	10.9	6.6	4.3
RRIM 501 ...	10.9	6.5	4.4
RRIC 24 ...	10.2	6.1	4.1
,, 23 ...	9.5	6.0	3.5
,, 16 ...	10.0	6.0	4.1
,, 28 ...	10 4	5 8	4.6
,, 32 ...	9.2	5.7	3.5
,, 26 ...	9.9	5.7	4.2
,, 21 ...	9.6	5.7	3.9
IRCI 10 ...	9.9	5.7	4.2
RRIC 19 ...	8.8	5.4	3.3
,, 33 ...	8.2	5.2	3.0
,, 17 ...	8 9	5.2	3.7
,, 25 ...	8.8	5.1	3.7
,, 37 ...	8.5	5.1	3.4
,, 29 ...	8.8	4.9	3.9
,, 20 ...	7.4	4.7	2.7
PB 86 ...	7.4	4.7	2.7
AVROS 1301 ...	7.8	4.6	3.2
RRIC 27 ...	8.2	4.4	3.8
PR 107 ...	6.8	4.2	2.6
RRIC 30 ...	6.0	3.5	2.5
Mean ...	9.3	5.7	3.6

This area showed an average increase of only 1.8 inches in 1956/57. The poor rate of growth has been successfully counteracted by increased doses of fertilizer especially recommended for this area.

1955 Large-Scale Clone Trial, 78 Acres, Hedigalla Estate:

Twelve RRIC clones are planted in this trial in monoclonal blocks of 750 trees each, which will provide 3 tapping tasks for yield recording in the future. Girth measurements were taken of every 5th tree permanently marked in the field for these measurements. The girth figures for 1957 and 1958 are summarized overleaf.

1955 Large-Scale Clone Trial

Average Girth in Inches

Clone	RRIC 9	RRIC 11	RRIC 12	RRIC 13	RRIC 14	RRIC 40	RRIC 41	RRIC 43	RRIC 46	RRIC 47	RRIC 49	RRIC 50	Mean
Girth 1958	8.9	9.9	9.4	7.0	9.5	6.7	8.1	7.9	7.0	8.7	8.6	8.0	8.3
Girth 1957	5.1	5.6	5.2	4.5	5.6	4.1	4.5	4.8	4.7	4.9	4.9	4.9	4.9
Increase 1957/58	3.8	4.3	4.2	2.5	3.9	2.6	3.6	3.1	2.3	3.8	3.7	3.1	3.4

The rate of growth, indicated by the girth increases for 1957/58 of most of the clones, is very satisfactory.

1957 and 1958 Planting Programmes:

The areas planted in 1957 and 1958 are mostly located on outside commercial estates, because of the shortage of land in the Institute for further clone trials of planting material developed by the Institute for high yields. A number of foreign clones imported in recent years on an exchange basis have been included together with promising R.R.I.C. clones in these clone trials for early information.

The field staff of this Institute supervised by the Botanist will be responsible for the general development of these experiments with regard to labels, plans, and recording of growth and yield figures.

1957 Clone Trials:

The following clones were planted in 300-tree plots on two estates in the Kalutara district:—

Clones RRIM 602, 603, 607, 612, 622, 623, IRCI 2 and 3, AVROS 529, 1734, 2037, TR 1406, 1542, 1548, WR 101, RRIC 60, 61, 75 and 76, PR 248 and 254. Clone PB 86 has been used in control plots.

1957 North-East Monsoon Planting, Hedigalla Estate:

Approximately 16 acres of cleared jungle land left over from the 1956 clearing of 71 acres was planted in the North-East monsoon period. 196 ten-tree clones, established from a selection of H.P. seedlings of the 1945, 1954 and 1955 pollination programmes, were planted in a section of this clearing. 25 ten-tree clones of the best yielding H.P. seedlings, selected from a total of 893 LCB crosses carried out by the Mycologist in 1951, completed the planting material which was prepared by the Botany Department. The 25 clones were included in a new "D.R." series of clones which will be tested for resistance to Oidium heveae.

1958 Clone Trial and Manuring Experiment on a Commercial Estate, Kalutara District:

With our previous experience of testing new high-yielding clones planted in virgin jungle on Hedigalla Estate, with its high rainfall and poor soil conditions, a decision was made to plant the future clones on old rubber land as replants. The

new foreign and local clones tested on replanted rubber land will give us more accurate information for making recommendations on planting material for our rubber replanting schemes, which are mostly concentrated in old rubber land.

The following clones were planted in approximately 300-tree blocks of each clone with clone PB 86 as a control:—

Clones GT 1, AVROS 385 and 427, IRCI 2 and 6, RRIM 605 and 607, RRIC 22, 28, 41, 45, 36, 37, 39, 52, 54 and 55.

The manurial experiment with three levels of Potash in RRIC complete mixtures is confined to blocks with clones GT 1, IRCI 2, RRIM 605, RRIC 28, 45, and PB 86.

Crown Budding Investigations:

The prospect of crown budding with clone LCB 870, which is highly resistant to Oidium heveae, was very encouraging when the clone was first discovered. In recent years we have, however, found that clone LCB 870 can be severely attacked by Phytophthora causing pod-rot and leaf fall. This characteristic of the clone obviously depreciates its value as a disease-resistant crown for large scale use in commercial plantings, especially in the wetter rubber growing districts.

In the series of crown budding experiments initiated at a time when crown budding was favoured there are indications that a low yielding crown can depress the yields of a high-yielding budded centre-section, whether the clone is budded at a height of 5 feet or 8 feet. It is known that clone LCB 870 is the poorest yielding clone in test tapping in our field trials at the present time. This will rule out the use of clone LCB 870 for crown budding even in the drier rubber growing areas.

The large-scale trial at Dartonfield described below with five high-yielding clones crown budded in half-plots over 30 acres with clone LCB 870 should give us a more conclusive answer.

1952 Large-Scale Clone Trial, 35 Acres, Dartonfield—Effects of Crown Budding on the Growth of Centre Sections:

One-half of 200-tree plots each of five clones replicated fourfold over 35 acres was crown budded with clone LCB 870 in August, 1954, at a height of 8 feet from ground level, after approximately 2 years of growth.

Girth measurements of every 5th tree were taken in August of each year of the crown budded trees and control trees which were not crown budded. The results up to 1958 are summarized in Table XII A and XII B.

TABLE XII A

Crown Budding Trial, 1952 Clearing, Dartonfield
Average Girth Measurements in Inches

Clones	Not crown budded (control)				Crown budded			
	1956	1957	1958*	Increase 1957/58	1956	1957	1958	Increase 1957/58
PB 86 ...	13.3	16.4	18.9	2.5	10.1	13.7	16.6	2.9
PRIM 501 ...	14.8	18.0	19.8	1.8	10.2	14.2	17.0	2.8
Nab 12 ...	13.8	17.5	20.1	2.6	10.0	13.7	17.1	3.4
,, 15 ...	16.8	21.2	23.6	2.4	11.5	16.0	19.7	3.7
,, 20 ...	14.4	19.0	21.6	2.6	9.8	13.8	16.7	2.9
Mean ...	14.6	18.4	20.8	2.4	10.3	14.3	17.4	3.1

*Trees in tapping 1958.

TABLE XII B

Summary of Growth Figures 1952 Crown Budding Trial
Girth in Inches

	Trees not crown budded	Trees crown budded	Girth differences
Prior to crown budding at the end of 2nd year of growth	6.4	6.3	0.1
August 1955	10.9	7.6	3.3
,, 1956	14.6	10.3	4.3
,, 1957	18.4	14.3	4.1
,, 1958	20.8*	17.4	3.4

*Trees in tapping 1958.

After 4 years the girth of the crown budded trees is still 3.4 inches behind that of the control trees. The control trees were tapped in 1958 and therefore shows a poorer increase in girth when compared with the crown budded trees which have not been tapped; these trees will be tapped in 1959.

Effects of Crown Budding on the Yield of Clonal Seedlings:

One hundred and seventy pairs of twinned seedlings were planted with one of each pair in two opposite rows. At two years of age each pair was crown budded; one with the low-yielding Oidium-resistant clone LCB 870 and the other with the high-yielding Oidium susceptible clone Tjir 1, at heights of 4, 5, 6, 7 and 8 feet from ground level on a selected number of pairs.

Owing to the effective control of Oidium by sulphur dusting clone Tjir 1 has not been infected with Oidium in this experiment.

The results of the 1958 test tapping are summarized below:—

1948 Twin-Seedling Area, Hedigalla
Tapped S/2, d/3, 67%

Yield in grams per tree per tapping, 1958

Clonal Seedling	No. of pairs	Crown	
		Tjir 1	LCB 870
Tjir 1	38	34	30
PB 86	39	32	27
Glen 1	23	26	23
Mil 3/2	46	30	27
Unselected	27	22	23
Total	173	Mean 29	26

In the third year of tapping the indications of an improvement in yield of the clonal seedlings with crowns of the high yielding clone Tjir 1 still persists compared with the crowns of clone LCB 870.

Large-Scale Crown Budding Experiment, 1945 Clearing, 11¾ Acres, Hedigalla:

Three high-yielding clones PB 86, Tjir 1 and Glen 1 and three comparatively low-yielding clones AVROS 256, PM 17 and Rub 393 have been used in this experiment in a balanced "split plot" layout, both as budded centre sections and budded crowns at a height of 5 feet and 8 feet. Three-tree sub-plots are used for comparing the crown budding at the two heights given above.

The results for 1958 test tapping are given in Table XIII, which also indicates the general layout of the experiment in a single replication. There are three such replications. The controls for comparisons are given in bold type print; the figures give the yields of the 6 clones with their own crowns.

The trees are in tapping for the fourth year and the tapping system has been changed to S/2, d/2, 100% from S/2, d/3, 67%.

TABLE XIII

Crown Budding Experiment, 1945 Clearing, Hedigalla

Tapped S/2, d/2, 100%

Yield in grams d.r. per tree per tapping

Budded Centre Section	Height of Budding	Crowns						
		Tjir 1	AVROS 256	PB 86	PM 17	Glen 1	Rub 393	Mean
Tjir 1 ...	5 ft.	**36.4**	29.4	37.1	26.2	43.3	28.9	33.5
	8 ft.	**42.8**	27.7	45.3	24.0	43.1	26.0	34.8
AVROS 256 ...	5 ft.	29.1	**22.3**	28.5	22.0	29.1	25.0	26.0
	8 ft.	30.7	**20.4**	27.4	22.1	28.6	23.8	25.5
PB 86 ...	5 ft.	36.1	33.2	**38.8**	26.4	35.9	33.0	33.9
	8 ft.	39.6	33.9	**38.5**	27.3	39.1	28.9	34.6
PM 17 ...	5 ft.	31.4	29.5	43.6	**22.4**	32.3	28.3	31.2
	8 ft.	29.7	27.9	39.4	**24.3**	35.6	25.6	30.4
Glen 1 ...	5 ft.	45.1	33.7	44.2	35.2	**37.5**	33.8	38.2
	8 ft.	32.6	38.0	37.4	27.6	**38.5**	38.4	35.4
Rub 393 ...	5 ft.	30.6	32.6	38.0	22.9	30.0	**29.5**	30.6
	8 ft.	37.9	31.8	29.4	23.1	34.4	**28.9**	30.9
Mean ...		35.2	30.0	37.3	25.3	35.6	29.2	32.1

The results in 1958 again indicate that in the case of budded rubber there is no difference in yield of any practical significance for crown budding at heights of 8 feet and 5 feet from ground level. The tapping panel comes up to a height of approximately 3½ feet from ground level.

Clones PB 86, Tjir 1 and Glen 1 have generally improved the yields of the budded centre-sections of the low-yielding clones. Clone PB 86 has improved the yield of the low-yielding clone PM 17 with its own light crown to a greater degree than the yield of clone AVROS 256 which has a heavy crown. It would appear, therefore,

that both the foliage capacity and the inherent high-yielding characteristics of a "crown" clone have an effect on the yield of the budded centre-sections.

The breeding work for high yielding clones, resistant to the more important leaf and stem diseases, has been initiated in recent years and the prospect of crown budding for resistance to leaf diseases on a commercial scale is rather remote. In the meantime, however, further observations of interest will be made on the existing crown budding experiments.

Miscellaneous Experiments—Large-Scale Clone Trial, Planted 6′×45′, 1949 Clearing, 35 Acres, Hedigalla:

The yields of selected clones in this area are presented in Table XIV. Clone PB 86 is taken as a control together with a number of RRIM clones of the "500" series which have been included in this experiment.

There are six 25-tree plots of each clone in an incomplete randomised block layout. There are 31 clones in all in this experiment.

TABLE XIV

Clone Trial Planted 6′×45′, 1949 Clearing, Hedigalla
Tapped S/2, d/3, 67% from July, 1956

Yield in lb. d.r. per tree per year

Clone	No. of trees tapped	Yield 1958	Bark Rot and Canker cases	Brown Bast cases	Wind damage cases
PB 86 ...	139	7.6	17	1	—
Nab 17 ...	132	8.1	46	—	—
PB 6/50 ...	155	6.9	111	—	—
RRIM 513 ...	138	7.0	2	—	—
RRIM 501 ...	132	6.9	20	—	—
Nab 20 ...	138	7.7	3	4	—
No. 30 ...	141	7.0	—	—	—
No. 49 ...	131	5.5	1	1	—
No. 44 ...	126	5.3	4	—	—
RRIM 504 ...	129	5.1	22	—	—
No. 29 ...	149	5.5	5	1	—
Lun N ...	125	5.2	3	—	—
No. 48 ...	131	5.1	—	—	—
RRIC 52 ...	139	5.1	1	—	—
Dar 38 ...	130	5.0	32	—	—

In 1959 the tapping system will be changed to S/2, d/2, 100% and the yields of the better known clones tapped at 100 per cent intensity are awaited with interest in this avenue planting experiment. Observations will also be made on secondary characters especially on bark renewal.

The high incidence of Phytophthora Bark Rot has been a major feature in 1958. Under heavy infection from adjacent clearings some of the more susceptible clones have been badly infected with this disease on the tapping panel, especially

clone PB 6/50. The Bark Rot cases have been brought under control with the new organo-mercuric fungicide Antimucin and with Kankerdood. Under climatic conditions which favour Phytophthora diseases the severity of the attack is partly associated with the proximity of the 25-tree plots to the foci of infection. The numbers of infected trees do not give a correct picture of the relative susceptibility of the various clones under trial. Fortuitous circumstances of random arrangements of plots on a mountain slope according to the layout of this experiment could have placed the plots of some susceptible clones away from the foci of infection.

Clone NAB 17, which is the highest yielding clone in this trial, is badly affected by Bark Rot. It could also develop a high incidence of Brown Bast when tapped on a 100% intensity.

The yield of clone RRIC 52 in third year of tapping is still inferior to that of most other clones represented in this trial.

No wind damage cases have been reported.

Tapping of Clone LCB 870 on Glendon Group, Neboda:

The test tapping of clone LCB 870 was continued in 1958 in the last year of test tapping on this outside estate. The yields are summarized below. It is a final confirmation of the extremely poor yielding qualities of clone LCB 870.

	1956	1957	1958
Total number of trees tapped ...	67	67	64
Total number of tappings	716	636	757
Total yield in gms. d.r.	4082.9	5554.1	5845.9
Yield in lb. d.r. per tree per year ...	1.8	2.7	2.4

Laboratory and Minor Field Investigations:

The Research Assistant who resumed duties in 1958 after his post-graduate course at Cambridge University has carried out some preliminary investigations with Gibberellic acid, stock-scion effects, and the rooting of Pueraria cuttings. A short summary of his findings are given below:

Experiment 1.—Gibberellic Acid as a Yield Stimulant:

Gibberellic acid was used, in concentrations of 25, 50 and 100 parts per million in a mixture of equal parts of talc and lanoline, as a yield stimulant for rubber. The applications were made on a few trees on 3-inch wide strips of bark after scraping; the controls were treated with lanoline and talc only. A concentration of 100 parts per million of Gibberellic acid gave an appreciable increased yield over the controls. These preliminary findings remain to be confirmed in more comprehensive experiments.

Experiment No. 2.—Rooting of Pueraria Cuttings:

Pueraria cuttings with two or more leaves rooted more succesfully than cuttings without leaves. The presence of leaves on cuttings treated with 10 parts per million of Indolyl-butyric-acid increased the rooting to 100 per cent in sand culture.

Experiment No. 3.—Off Season Flowering and Pollinations:

In 1956 ten budded stumps each of clone FX 25, FX 2784 and RRIC 52 were planted at an angle of 30° from ground level in nurseries. Five stumps of each

clone were planted with the bud patch above the soil level and five stumps with the patch about an inch below the soil level. The plants were allowed to grow with a low branching habit.

In August, 1957, the trees were ring-barked at 6 ins. above ground level and the branches were kept bent in a horizontal position. This could be done easily as the budded stumps were planted at an angle of 30°. The secondary branches were allowed to grow normally. All the plants flowered in September, 1958. Out of 18 test cross-pollinations two fruits were obtained from the young trees.

At the end of the flowering period new shoots were allowed to grow below the ring-barked areas. The trees then put out a new flush of leaves together with a fresh crop of flowers.

REPORT OF THE PLANT BREEDING SECTION

By

W. E. Manis

SUMMARY

The new Plant Breeding Section was established in early July, 1958, with the arrival of the Plant Breeder who has been assigned to this Institute for a two year period through the "Technical Aid Program" of the United States Operations Mission to Ceylon.

During the initial six months period of this section, time and efforts have been devoted principally to: (1) reviewing the Institute's past Hevea breeding programmes and evaluating the results of these programmes; (2) observing the Hevea Plantation Industry in Ceylon, its problems and needs in relation to the potentialities of plant breeding; (3) formulating plans for the future breeding work and the inter-related projects.

The policy of this Section, for the impending breeding season, is to continue the present line of sound Hevea breeding for Oidium-resistance and yield carried out by the Botany Department during the past few years. Guide lines are being laid down for subsequent seasons for the inclusion of the recently introduced Western Hemisphere clones resistant to *Dothidella ulei* and tolerant to *Phytophthora palmivora*.

Investigations and accepted practices for the stimulation of early flowering, which is of paramount importance to our projects, have been started.

Four experimental plantings at Hedigalla, formerly under the Plant Pathology Department, were transferred to the Plant Breeding Section for continued observation and conversion to top-worked breeding gardens.

The 1957 Twinned-Seedling Nursery, established under the Plant Pathology Department, was also turned over to this Section. A 1958 Twinned-Seedling Nursery has been planted as part of the routine operation of the Section.

The care and maintenance of the Western Hemisphere clones which are of potential use in the breeding programme and located in the Nivitigalakele budwood multiplication nurseries have been given over to this Section by the Botany Department.

The complete co-operation and assistance the Plant Breeder has received from the entire Staff of the Rubber Research Institute of Ceylon and its Board has been most gratifying. An expression of sincere thanks is extended to all concerned.

DETAILED REPORT

Staff:

Mr. W. E. Manis, Plant Breeder, arrived in Ceylon in late June, 1958, and took up duties at Nivitigalakele on the 5th of July.

Mr. D. M. Fernando, Assistant Plant Breeder, has been on duty and successfully carried out the 1958 hand-pollination programme and other details pertinent to the breeding and selection work.

Mr. C. Amaracone, Technical Assistant at Nivitigalakele, has been assigned, temporarily, to take care of the clerical duties of the newly formed Plant Breeding Section.

Visits.

Several estates in the Kalutara district have been visited so that the Plant Breeder could become acquainted with various phases of the plantation industry in Ceylon. The Superintendents of estates visited have been most generous in giving of their time for this purpose.

The Plant Breeder addressed the Kalutara, the Kelani Valley and the Southern Province Planters' Associations meetings on the aims of the Plant Breeding Section of the Institute. The general context of these addresses has been to explain the Institute's reasons for bringing the Western Hemisphere (Dothidella-resistant) clones to Ceylon and how they will be used in the breeding work, with emphasis on the backcross method of plant breeding. By using this procedure a known result may be obtained in the shortest possible time. Thus the clonal material for future replanting in Ceylon may very well carry with it yield as well as resistance to Dothidella and Oidium and a high degree of tolerance to Phytophthora.

Evaluation Studies.

An intensive survey of all Institute registered clones is well under way. Complete notes on secondary characters, on disease reactions and on general plant habit and conditions have been recorded and combined with yield data and performance records obtained from the Botany Department. A permanent clone file, with specific reference to the Plant Breeding Section, is thus being compiled. The selection of parents for future breeding programmes will be facilitated with this clone record at hand.

Field Experiments.

Two hundred seedling trees in the 1935 clearing, Nivitigalakele, have been given to this Section for the stimulation of early flowering experiments. Fifty of the trees were pollarded at heights from six to eight feet in late August, 1958. Sprouts have been allowed to develop on the upper foot of the stumps. In early 1959 many of the shoots will be ready to be budded with FX and IAN clones for early flowering. By this method flowers can be expected in two to two and a half years rather than having to wait the normal five to six year period.

The Hedigalla plantings transferred to this section by the Plant Pathology Department are: (1) $\frac{1}{2}$ acre 1954 clearing, Hand-Pollinated Seedling Trial; (2) 5 acre 1954 clearing, Hand-Pollination Experiment with clone LCB 870; (3) 26.5 acre 1954 clearing, Oidium-Resistance Experiment; (4) 7 acre 1954 clearing, Oidium-Resistance Experiment. The routine attention to these experiments is carried out by the Estate Department. Plans for converting a section of the 26.5 acre planting into an open pollinated seed garden using selected IAN and Eastern clones are being developed.

Nurseries:

The 1957 Twinned Seedling Nursery of 14,000 plants, established by the Pathology Department, was transferred to the Plant Breeding Section. The 1958 Twinned-Seedling Nursery planted by this section in November-December contains 7,500 plants. Survival to date has been excellent.

Seedlings of the 1956, 1957 and 1958 hand-pollination programmes remain in the Nivitigalakele nursery ready to be cloned as soon as the new sub-station, where they are to be planted out, is decided upon.

All clones of Western Hemisphere origin, *i.e.* those with F, FB, FX and IAN designations in the Nivitigalakele multiplication nurseries, have been placed under direct care and supervision of this section. Twenty four FX and IAN clones obtained from Liberia in October of this year gave excellent budding results—all clones received were established. The total number of Dothidella-resistant clones now in Ceylon is 96. Individual clones in this sizeable collection of breeding material have been selected from jungle trees, from large seedling populations arising from seed collections made in widely divergent natural habitats, from primary crosses and from first backcrosses and first outcrosses. While *en route* to Ceylon the Plant Breeder had the opportunity to observe the majority of these clones as established field plantings, four to sixteen years of age, in Costa Rica and in Brazil.

Plans:

The 1959 breeding programme will follow the same general lines as previous programmes carried out by the Botany Department; the objective, to obtain yield and Oidium resistance, remains the same. The programme will be amplified over that of 1958, as indicated on the following page.

A series of experiments to obtain effective control of fungous diseases which severely limit the number of seeds resultant from the hand-pollinations are to be conducted.

Testing the Western Hemisphere clones as well as those of recent hand-pollination programme for Oidium resistance and Phytophthora tolerance (under Ceylon conditions) is to be carried out at a high elevation estate. These tests which are pathological will be done in close co-operation with the Plant Pathology Department.

High priority will be given to stimulating early flowering in young buddings and seedlings through artificially induced physiological disturbances.

Results of the 1958 Hand-Pollination Programme:

Station	Parentage	No. of polli-nations made	No. of Seed harvested	No. of Seed germinated	Germination percentage
D'field	PB 86 × T 306	1,149	49	44	89.8
,,	T 306 × Tjir 1	104	3	—	—
,,	PB 86 × T 792	1,392	46	43	93.5
,,	T 792 × RRIC 52	135	36	1	2.8
,,	T 792 × Tjir 1	826	79	1	1.3
,,	T 713 × RRIC 52	339	7	4	57.1
,,	T 713 × Tjir 1	1,642	12	5	41.7
,,	PB 86 × T 243	2,978	22	14	63.6
H'galla	RRIC 52 × T 304	238	—	—	—
D'field	T 304 × PB 86	162	—	—	—
,,	T 304 × RRIC 52	449	—	—	—
,,	T 304 × Tjir 1	1,490	—	—	—
,,	T 237 × RRIC 52	67	3	2	66.7
,,	PB 5/139 × T 16	1,134	—	—	—
,,	T 16 × Ch 26	33	—	—	—
,,	T 16 × RRIC 52	50	—	—	—
,,	T 16 × Tjir 1	1,039	9	4	44.4
,,	T 180 × RRIC 52	631	6	3	50.0
,,	T 180 × Tjir 1	1,023	20	13	65.0
,,	T 254 × PB 86	118	—	—	—
,,	T 254 × Tjir 1	160	—	—	—
,,	T 4 × Tjir 1	22	—	—	—
,,	T 170 × RRIC 52	124	56	21	37.5
,,	T 170 × Tjir 1	462	54	12	22.2
,,	LCB 870 × Tjir 1	248	—	—	—
,,	PB 86 × RRIC 52	29	—	—	—
,,	PB 86 × Tjir 1	774	—	—	—
H'galla	RRIC 52 × Ch 26	2,067	—	—	—
,,	,, 52 × RRIC 55	1,994	—	—	—
,,	,, 52 × Wag 6278	1,796	—	—	—
N'kele	,, 52 × Wag 6278	4,350	—	—	—
H'galla	Tjir 1 × Ch 26	342	—	—	—
N'kele	,, 1 × LCB 1320	225	4	—	—
H'galla	,, 1 × RRIC 52	537	—	—	—
N'kele	,, 1 × RRIC 52	150	—	—	—
,,	,, 1 × Tjir 1	970	—	—	—
H'galla	,, 1 × Wag 6278	380	—	—	—
N'kele	,, 1 × Wag 6278	770	15	5	33.3
H'galla	Wag 6278 × Ch 26	9	—	—	—
,,	,, 6278 × RRIC 52	99	—	—	—
N'kele	,, 6278 × RRIC 52	1,600	3	1	33.3
,,	,, 6278 × Tjir 1	1,260	30	2	6.7
H'galla	RRIC 52 × LCB 1320	383	—	—	—
	Total	33,750	454	175	38.6

T=Tree No. of 'LCB 870 × PB 86' cross used (arranged in the descending order of merit on yields ascertained on the Morris/Mann system of test tapping).

REPORT OF THE PLANT PATHOLOGY DEPARTMENT

By

Alfred Riggenbach

SUMMARY

GENERAL.

The volume of work of the Department remained within the limits of the previous year.

The Plant Pathologist proceeded on home leave on the 5th December.

The Assistant Plant Pathologist was fully engaged during the whole year on advisory visits and in supervising field experiments.

OIDIUM HEVEAE.

Due to the unusual wet weather in December, 1957, "wintering" and refoliation were greatly retarded. Most areas wintered around the middle of February and refoliated at the end of February and early in March.

The weather conditions throughout the refoliation period were unfavourable for the development of the fungus Oidium heveae. The incidence of the Oidium leaf disease thus remained mild or even insignificant in most rubber growing districts.

Heavier attacks of the disease were kept well under control by routine sulphur dusting.

The low incidence of Oidium adversely affected the field experiments. Of three experiments only the one designed to compare electrostatic with ordinary dusting yielded worthwhile results.

PHYTOPHTHORA PALMIVORA.

The incidence of Phytophthora leaf disease during the S.W. monsoon season was fairly heavy, especially in the more humid districts. The disease was, however, well controlled on estates where susceptible areas were properly treated with copper-based dusts.

Twelve field experiments designed to test various methods and fungicides for the control of the Phytophthora leaf disease were carried out. These experiments covered a total area of 248 acres, distributed over 5 estates in different districts.

The tested fungicides included copper-based, organo-metallic and organic fungicides. The experiments showed that the Phytophthora leaf disease can be effectively and economically controlled by dusting with suitable copper-based dusts at appropriate rates and intervals.

Organo-metallic and organic fungicides were less effective and more expensive than copper-based fungicides.

A great number of laboratory experiments were carried out with various fungicides for the control of Phytophthora bark disease (Black Stripe disease or Bark Rot).

ROOT DISEASES.

A considerable number of laboratory tests were carried out with various fungicides for the control of the White Root disease, caused by Fomes lignosus. In all these tests carried out with a wide selection of fungicides, Tillex, an organo-mercury compound, proved to be the only really effective fungicide.

FIELD EXPERIMENTS.

The long term field experiments in connexion with the breeding of resistant clones and with crown budding were continued, supervised and given the necessary attention. In August five of the six experiments were handed over to the new Plant Breeding Section.

DETAILED REPORT

1. GENERAL:

A. Staff.—The Plant Pathologist was on duty up to 5th December, 1958, when he proceeded on home leave.

The Assistant Plant Pathologist, Mr. O. S. Peries, was appointed Acting Pathologist with effect from 6th December. He was on duty throughout the year.

Mr. H. L. Munasinghe, Senior Technical Assistant, Mr. E. G. Mendis and Mr. T. M. Fernando, Technical Assistants, were on duty throughout the year.

Mr. L. T. Jayaweera, Technical Assistant, resigned on 5th March, 1958.

Mr. S. K. Samaraweera was appointed Technical Assistant and assumed duties on 2nd June, 1958.

B. Correspondence.—The figures for 1957 and 1958 are as follows:—

Correspondence	1957	1958
Incoming letters	1,153	671
Outgoing letters	1,384	868

These figures include both advisory and general correspondence.

C. Visits.—The figures for 1957 and 1958 are as follows:—

Visits carried out by	Advisory		In connexion with RRIC experiments	
	1957	1958	1957	1958
Plant Pathologist	18	18	51	29
Assistant Plant Pathologist ...	76	37	93	66
Total ...	94	55	144	95

The Plant Pathologist and the Assistant Plant Pathologist paid altogether 150 (1957: 238) visits to different estates. 55 (1957: 94) of these were in connexion with pathological problems on estates and smallholdings. For each case a report containing our observations and recommendations was sent to the estates or agencies concerned.

95 (1957: 144) visits took place in connexion with experiments.

D. Visitors.—As usual a number of visitors called at the Department during the year. These visits entailed discussions on the occurrence and control of diseases with planters, the use of new fungicides with agents from commercial firms and general topics of Hevea diseases, mainly with visitors from abroad.

E. Publications.—A note entitled "Fomes noxius, a Thiamine-deficient Fungus" by the Plant Pathologist, appeared in "Nature," Vol. 182, No. 4646 dated 15th November, 1958.

Furthermore the Plant Pathologist wrote three papers for the R.R.I.C. Quarterly Circulars:

"A Note on the Chemical Control of The White Root Disease of Rubber" (Combined 1st & 2nd Quarterly Circulars 1958).

"A New Waterproof Fungicide" (Combined 1st & 2nd Quarterly Circulars 1958).

"Experiments on the Control of Oidium heveae" (Combined 3rd & 4th Quartely Circulars 1958.)

R.R.I.C. Advisory Circulars No. 45, 46, 48 and 54 were completely revised and re-written by the Plant Pathologist. The result of research carried out during the past three years was incorporated in the new issues, which are:

Adv. Circ. No. 62 (46) "The White Root Disease of Hevea, Fomes lignosus."
Adv. Circ. No. 63 (48) "Brown Root Disease of Hevea, Fomes noxius."
Adv. Circ. No. 64 (54) "Bark Rot and Canker of Hevea, Phytophthora palmivora."
Adv. Circ. No. 65 (45) "The Phytophthora Leaf Disease of Hevea, Phytophthora palmivora."

At the beginning of the year, a stencilled leaflet "Notes for the Phytophthora Season 1958" was distributed.

2. LABORATORY AND FIELD WORK:

A. Diseased Specimens.

In all 65 (1957: 72) specimens were sent or brought to the Plant Pathology Department for examination and report.

The examination of diseased specimens in the laboratory entailed in most cases the growing of the casual fungi in culture for definite diagnosis of the diseases.

The various diseases, pests or other causes of damage found on these specimens are listed in the following table:—

Hosts and Nature of Diseases, Pests or Damage	No. of cases
1. Diseases, pests and damages of Hevea brasiliensis caused by:	
(*a*) *Fungi or bacteria:*	
Botryodiplodia theobromae	1
Corticium salmonicolor	1
Fomes lignosus	9
Fomes noxius	3
Gloeosporium alborubrum	8
Helminthosporium heveae	2
Hypocrella reineckiana	2
Oidium heveae	6
Phytophthora palmivora	7
Ustulina zonata	1
(*b*) *Pests and other causes:*	
Mites and various Insects	2
Scale Insects	3
Lightning Damage	1
Sun damage	1
Water damage	1
Wind damage	4
Other causes	11
2. Diseases, pests and damage of Cover Crops caused by:	
(*a*) *Fungi or bacteria:*	
Synchytrium ovalifolium	1
(*b*) *Pests and other causes:*	
Insects	1

B. Oidium heveae.

1. General.—The incidence of Oidium heveae during the 1958 season was generally mild or even negligible.

As the end of 1957 was unusually wet, the wintering season was greatly retarded. Wintering started only by about the end of January or early in February. Although the refoliation period was thus very late, the incidence of Oidium remained mostly insignificant as weather conditions were unfavourable for a heavy outbreak of the disease. Only some very late wintering areas experienced heavier attacks.

The disease was kept well under control by Sulphur dusting. A great number of Estates reported only very mild outbreaks of Oidium.

2. Field Experiments.—Three field experiments were prepared and laid down on three different estates. One experiment, at Neuchatel Estate, was designed to compare three different colloidal sulphur dusting preparations. The other two, at St. George and at Dalkeith Estates, concerned electrostatic dusting.

The low incidence of Oidium, however, adversely affected these experiments, and at Neuchatel and Dalkeith the experimental areas were entirely free of the disease. The experiment at St. George Estate produced assessable results.

Electrostatic dusting *vs.* normal dusting experiment.

General: This experiment was laid down to obtain some information on the performance and effect of a new type of machine, the electroduster, and a new method of dusting, the electrostatic dusting method.

The experiment was carried out on St. George Estate in a 30-acre area of clone Tjir 1 planted in 1938. Fifteen acres were dusted with the ordinary Mistral II AB duster and 15 acres with the Mistral Agricola Electroduster which is a standard Mistral II AB fitted with the Agricola electrodusting device.

Dusting was carried out with normal dusting sulphur at 6 lb./acre for the first four rounds and at 10 lb./acre for the three subsequent rounds. The dusting rounds were spaced at seven day intervals.

Results: The result of the experiment was assessed by leaf counting. In the area treated with the Mistral Agricola Electroduster a total of 14,820 leaves and in the area dusted with the ordinary Mistral II AB a total of 30,081 leaves (shed as a result of Oidium attack) were recorded in the leaf counting plots of 5′ × 5′ (4 plots per acre). From this it would appear that with electrostatic dusting (using the Mistral Agricola Electroduster) the control of Oidium could be considerably improved compared with normal dusting methods and the same quantity of sulphur.

As these results have been obtained from a single field experiment they must await confirmation before reliance can be attached to them. The experiments will be repeated next year.

C. Phytophthora palmivora.

Phytophthora leaf disease.

1. General.—The incidence of the Phytophthora leaf disease during the S.W. monsoon season was fairly heavy, especially in the more humid districts.

2. Field experiments.—Twelve field experiments designed to test methods and fungicides for the control of the Phytophthora leaf disease were carried out. These covered a total area of 248 acres distributed over 5 estates in different districts.

Ten experiments were laid out to test different copper-based, organo-metallic and organic fungicides.

Two experiments were carried out to compare electrostatic dusting with normal dusting.

Some experiments were repetitions of last year's test in order to obtain confirmation of the 1957 results if possible.

3. Results of experiments with fungicides:

(*a*) *Copper-based fungicides.*—As in 1952 the copper-based dusts proved to be the most effective and also the most economical fungicides against Phytophthora leaf disease. In accordance with last year's results, no difference could be observed between cuprous oxide and copper oxychloride preparations containing 4% of copper. There was also no significant difference between the different commercial brands of copper-based fungicides *e.g.* Blendox 4%, Copper Sandoz 4%, Cuprosana 4%, Cuproxol 4%, Oxycar 4%, Perecloud Special 4% etc.

Ordinary dusts for the control of the Phytophthora leaf disease should contain 4% copper in the form of cuprous oxide or copper oxychloride. At least 93 to 95% of the powder should pass through either a 300 mesh standard sieve of the British Standards Institution or a 325 mesh standard sieve of the American Society for Testing Materials. Filler and active ingredient should not separate when the dusts are sieved or applied.

The filler of the dust should with advantage be talcum or clay. Fillers containing quartz, limestone, brimstone, pumice, feldspar and similar hard materials should be avoided to prevent undue abrasion of the dusting machines. Latest field tests also indicate that, for rubber, dusts with bulk low density and light bulk density are the most effective.

A rate of application of 8 to 10 lb. per acre and round, with dusting rounds spaced at about 5 day intervals, will give adequate protection.

Ciba dust (with special incorporated sticker and particle distribution) containing 1% Cu was again found to be as effective as ordinary copper-based dusts containing 4% Cu.

(*b*) *Organo-metallic fungicides.*—The organo-metallic fungicides Zineb-Sandoz, containing 4% Zinc ethylene bisdithiocarbamate, and Ziram-Ciba, containing 2% Zinc-dimethyl-dithiocarbamate, gave adequate control at 10 lb. per acre and round.

However, these fungicides are much more expensive than copper-based dusts and it is an established fact that dithiocarbamates are accelerators in the rubber vulcanising process. The same specifications as for copper-based dusts apply also to organo-metallic dusts.

(*c*) *Organic fungicide.*—A Thiuram-based dusting preparation Thiotox-Sandoz, containing 4% of the active material tetra-methyl-thiuram disulphide, gave good results at 10 lb. per acre and round.

Thiuram-based fungicides, too, are much more expensive than copper dusts, and Thiuram is also an accelerator in the rubber vulcanising process.

(*d*) *Conclusions.*—Judging from experiments carried out to date, it would seem that effective and sufficiently economic control of the Phytophthora leaf disease of rubber is only obtained with copper-based fungicides. Latest evidence also shows that with elementary precautions copper contamination of the latex is practically insignificant. Only scrap may become more seriously contaminated but with appropriate measures, as described in the report of the Chemistry Department, this should not be an obstacle to effective Phytophthora control with copper dusts during the relatively short period when the disease would otherwise cause great damage.

4. Results with electrostatic dusting.—Two experiments were carried out to compare electrostatic dusting with normal dusting. Contrary to the result obtained during the Oidium season with sulphur dust, no difference could be found between the two methods when using copper dusts, although a special dust supplied by the makers of the electrostatic unit was tried.

This may be mainly due to the fact that the electrostatic dusting method works better the drier the leaves and the lower the humidity of the air, conditions hardly ever obtainable during the Phytophthora season.

Phytophthora bark disease:

Various laboratory tests with different water-miscible fungicides for the prevention and control of the Black Stripe disease or Bark Rot (caused by Phytophthora palmivora) were continued.

In all these tests Antimucin, an organo-mercury compound, proved once more to be by far the most effective water-miscible fungicide tested for the control of Bark Rot. Antimucin is now widely used on a large number of commercial estates and has proved most effective under practical field conditions, far better than any of the chemicals and materials formerly used.

The waterproof dressing Shell TB 192 and its active fungicidal ingredient were tested for fungicidal properties; both were found to be ineffective against Phytophthora palmivora. This material must, therefore, be regarded as a waterproof dressing and not as a waterproof fungicide.

D. Root Disease:

Laboratory testing of different chemicals for the control of Fomes lignosus was continued. Tillex Liquid, an organo-mercury compound, is still by far the most effective. A number of commercial estates which are now using Tillex Liquid on a large scale, instead of copper sulphate, for the curative treatment of young rubber trees have reported excellent results.

E. Field Experiments:

1. **Dartonfield 1 acre, 1953 Replanted area, Oidium Research Experiment.**—This area is planted with local and foreign clones for testing Oidium resistance and for carrying out other small-scale field trials.

The survey done during the Oidium season 1958 did not yield the expected results as the incidence of the disease was generally low.

2. **Hedigalla ½ acre, 1954 clearing, Hand-Pollinated Seedling Trial.**—In 1954, 251 hand-pollinated seedlings from the 1952 hand-pollination programme, consisting of crosses of the Oidium-resistant clone LCB 870 with high-yielding clones, were planted out as stumped seedlings in this area.

Early in 1958 the area was thinned out on girth measurements, and on further thinning out on test tapping yields 69 trees were retained.

3. **Hedigalla 5 acres, 1954 clearing, Hand-Pollination Experiments 1953 with clone LCB 870.**—652 hand-pollinated seedlings of the 1953 pollination programme were planted out in this area in 1954 and girth measurements of these trees were taken in February, 1958.

4. **Hedigalla 26.5 acres, 1954 clearing, Oidium Resistance Experiment.**—The area is hedge planted with clonal seedlings and budded stumps in alternate rows. The clonal seedlings have been thinned out to about the same number as the budded stumps.

5. **Hedigalla 7 acres, 1954 clearing, Oidium Resistance Experiment.**—Seedlings of crosses of clone LCB 870 with high-yielding clones, budgrafts made from these crosses, as well as illegitimate seedlings of clone LCB 870, planted in this area were given routine attention during the year.

The last four experiments were handed over to the Plant Breeding Section in August, 1958.

REPORT OF THE SOILS DEPARTMENT

By

A. J. Jeevaratnam

SUMMARY

The former Agronomy Department, re-named Soils Department, has been in the charge of the Assistant Soils Chemist during the year.

A start has been made in establishing a definite advisory service, based on plant and soil analysis, as envisaged in the five year programme of the Department. Samples from eight estates were analysed during the year. These analyses have been found to be useful in characterizing deficiencies of certain elements.

For the first time two cases of micro-nutrient deficiency in the field were investigated. These were suspected to be due to Zinc deficiency. The symptoms were of a transient nature, and may have been due to nutrient unbalance.

The plants showing Zinc deficiency in the field did not show any signs of Oidium attack. This observation lends support to the earlier finding that Zinc deficiency is unlikely to be a contributing factor in Oidium susceptibility in Ceylon.

The incidence of Magnesium deficiency in the field has been on the increase.

The 2 × 2 × 2 NPK trial in the 1938 clearing at Dartonfield, which has over the years shown the importance of phosphate for growth and yield was terminated early this year.

The NPK trial at Hedigalla has also shown consistent response to phosphate up to the time of tapping.

Of two NPK trials of a 3 × 3 × 3 design, the one at Moneragalla Group was terminated in June, 1958 due to the very unsatisfactory growth of the plants in one block. In the other 3 × 3 × 3 NPK trial at Paiyagalla Estate only one block gave certain responses.

Five NPK experiments of a 4 × 4 × 4 design were in progress during the year. The results of one of these experiments for 1958 are reported. These experiments have been in progress for only one year and therefore no conclusions have been drawn from the early results.

An experiment to test the effects of high and low Potash in NPK mixtures has been started in a clone trial area on Eladuwa Estate.

Another 2 × 2 × 2 NPK experiment has been started on Kumarawatte Group, Moneragalla.

Six hundred soil samples from 164 smallholdings from the forty one ranges, collected with the collaboration of the Smallholdings Advisory Department, have been indexed and some analytical work has been completed.

Two rhizobial strains that have clearly demonstrated their ability to fix Nitrogen under field conditions in new plantings are now being multiplied and issued to estates on request. Rhizobial cultures have been issued to eight estates in 1958.

Comparative studies on cover crops were extended to cover Guatemala grass (*Tripsacum laxum*), which is being increasingly grown in rubber plantations to provide thatching material. Leguminous cover crops have a high Nitrogen content whereas the non-leguminous crops investigated, Mikania and Tripsacum, have a high Potash content.

Latex stimulation work has been handed over to the Botany Department from the beginning of 1958.

DETAILED REPORT

General:

Staff.—Early this year this department which was formerly known as Agronomy Department was re-named Soils Department, by which name it was known prior to the appointment of Mr. D. H. Constable as Agronomist in 1951.

The Assistant Soils Chemist, Mr. A. J. Jeevaratnam, who has been in charge of the Department the whole of this year, was appointed Acting Soils Chemist in December, 1958.

Mr. T. Kanthasamy, Senior Technical Assistant, was on duty throughout the year.

Messrs. A. K. Gunadasa and E. R. Chelliah continued to work as Technical Assistants in the Department. Mr. Chelliah was confirmed in his post during the middle of the year.

Mr. U. K. D. Lewis, formerly Technical Assistant, was transferred to the field as Field Assistant on probation in 1958 and Mr. M. Goonewardena who was Field Assistant was appointed in Mr. U. K. D. Lewis' place on probation.

With the handing over of the Latex Stimulation work to the Botany Department, Mr. U. K. D. Lewis, Field Assistant, and Mr. Francis Abeysinghe, Field Attendant, who had been seconded to the Soils Department, worked under the Botanist from January, 1958.

Mr. M. Goonewardena resigned his post as Technical Assistant on 15-8-58.

Mr. D. J. M. Samarasinghe was appointed Technical Assistant from 1st November, 1958, to fill the vacancy.

Mr. M. Abeysinghe, Field Assistant, and Mr. K. S. A. C. Peiris, Field Attendant, seconded to the Soils Department by the Estate for manurial experimental work, were on duty throughout the year.

Mr. D. J. Jayasinghe, Field Attendant (Soils Survey), resigned his post on 18th September to better his prospects.

Mr. S. D. Jayaweera was appointed Field Assistant to fill the vacancy. He assumed duties on 17th October, 1958.

Messrs. Seemon Singho and B. A. Perera continued to work as Laboratory Attendants during the year.

A Rubber Instructor, Mr. G. P. G. Chootandasa and a Replanting Assistant, Mr. O. M. W. Tillekeratne, were seconded to the Soils Department from the Smallholdings Department to help with the preliminary laboratory work on the soil samples received from the Smallholdings Advisory Officer.

Correspondence.—

Inward	...	433
Outward	...	389

Visits.—Visits in connexion with experimental work were heavy during the year. This is due to the fact that the Acting Soils Chemist had to take charge of the field experiments with which he was not conversant prior to the departure of Mr. D. H. Constable. Fifty visits were made to experimental areas.

Advisory visits were made to thirteen estates on request. Five visits were made in connexion with soil survey, and eighteen other visits have been grouped as miscellaneous.

Meetings.—The Assistant Soils Chemist was a member of the Committee for Section B (Agriculture and Forestry) of the Ceylon Association for the Advancement of Science and attended two committee meetings held at Peradeniya during the year. He also attended the Fourteenth Annual Sessions of the C.A.A.S. held in December at Colombo, where two papers were presented by him, namely:—

1. Comparative Studies on Cover Crops under Hevea brasiliensis.
2. Zinc Deficiency on young Hevea brasiliensis.

Publications.—

(1) A note "Rhizobial Inoculation of Leguminous Cover Crops" was published in the Combined 1st and 2nd Quarterly Circulars for 1958.

(2) A paper entitled "Cabook or Laterite in relation to the Soil Survey of the Rubber Growing Districts," which was read at the thirteenth Annual Sessions of the C.A.A.S., was submitted for publication in the 1st Quarterly Journal, 1959.

1. Laboratory Work:

A start was made during the year in implementing the expansion of work envisaged in the five-year programme, *viz.* providing an advisory service based on the analysis of leaf and soil samples. This was in addition to leaf and soil analysis done in connexion with research problems. Analytical work was also done on cover crop samples.

1.1. Foliar Analysis:

Attempts were made to characterize deficiencies in the field by analysis of Hevea leaves in conjunction with soil analysis, for advisory work. Samples from eight estates were analysed in this connexion.

Judging from the findings of the advisory analyses, the incidence of Magnesium deficiency seems to be on the increase in recent times. Manurial trials with and without Magnesium are contemplated for next year.

1.2. Investigation on Nutrient Deficiency:

Zinc Deficiency.—For the first time two cases of deficiency in the field suspected to be due to a micro-nutrient, namely zinc, were noticed on two estates widely separated from each other, Nakiadeniya Group and Kumarawatte Group.

In view of the earlier suggestion by the R.R.I. of Malaya that Zinc deficiency may be a predisposing factor for susceptibility to Oidium attack, these occurrences of suspected Zinc deficiency in the field were of much interest.

Results of analyses of leaf samples are reported in Table I.

The results suggest that the deficiency may be due to a shortage of Zinc. According to previous work done in this Department and reported in R.R.I.C. Annual Report for 1956, the average Zinc content of 108 leaf samples of fully expanded hardened off leaves from four-year old trees of Clone PB 86 was found to be 20 parts per million (range 12-31 p.p.m.).

It has been suggested that it is certainly a possibility that leaf samples containing below 12-15 p.p.m. of Zinc in leaf dry matter may be deficient in that element. However, it has not been possible to establish definitely that these deficiencies were due to a lack of Zinc, since these deficiencies were only of a transient nature and no studies on the response to added Zinc could be carried out.

Plants affected occurred sporadically in the field and the plants were not heavily retarded in growth. The deficiency appeared to correct itself with a new flush of growth. At Kumarawatte, sometimes, of two plants in a planting point only one exhibited the leaf deficiency symptoms.

Zinc content in the leaves of plants that were recovering are reported in Table II.

The finding that the suspected deficiency was only of a transient nature suggests that it may have been due to the non-availability of that nutrient as a result of some soil reaction and not due to a general deficiency of the element in the soil. However, in view of the fact that Zinc deficiency in Cocoa has been reported particularly in the Dumbara Valley, it may be of advantage to pursue these investigations further.

It is of interest to note that the plants which exhibited Zinc deficiency in the field did not show any signs of Oidium attack. This observation is particularly important in the Moneragalla District where the incidence of Oidium is not confined to any particular season. This lends support to the earlier finding that Zinc deficiency is unlikely to be a contributory factor in Oidium susceptibility under Ceylon conditions.

TABLE I

Analysis of Deficient Leaf Samples—Nakiadeniya and Kumarawatte
Nakiadeniya. PB 86 buddings 18 months old. Deficient leaves.

	Nitrogen %	Phosphorus %	Potassium %	Calcium %	Magnesium %	Zinc ppm
1	—	0.08	0.60	1.59	0.23	9
2	—	0.10	0.39	0.95	0.10	14
3	—	0.09	0.28	1.05	0.18	14
4	—	0.15	1.01	0.63	0.06	17

Kumarawatte. Tjir 1 seedlings 6 months old. Deficient leaves

	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium	Zinc
	%	%	%	%	%	ppm
1	3.53	0.19	1.24	0.75	0.15	12.5
2	2.86	0.22	1.75	1.36	0.18	8.0

TABLE II

Kumarawatte. Tjir 1 seedlings 10 months old (Recovering plants)

	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium	Zinc
	%	%	%	%	%	ppm
1	3.20	0.20	1.10	0.97	0.23	19
2	2.40	0.20	0.99	0.88	0.26	22
3	2.76	0.13	1.08	0.87	0.20	25
4	3.10	0.13	0.99	0.93	0.20	25
5	3.10	0.14	1.63	1.07	0.30	12

Kumarawatte. Tjir 1 seedlings 12 months old (Recovered plants)

	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium	Zinc
	%	%	%	%	%	ppm
1	3.25	0.15	1.08	0.84	0.30	15
2	3.11	0.12	1.42	0.56	0.16	18

N.B.—Nutrient contents expressed in percentage or in parts per million, on the oven dry basis.

1.3. Magnesium Deficiency:

In view of the increase in the incidence of Magnesium deficiency in the field, preliminary investigations have been undertaken to compare the efficacy of applying Magnesium Sulphate as a spray with that of applying it to the soil in pockets.

1.4. Investigations in nutrient supply and uptake under field conditions:

Leaf samples taken from three out of the five 4 × 4 × 4 NPK trials were analysed in this investigation. The three experiments were on 1957 (S.W. monsoon) replantings at Ederapolla Group, Halpe Group and Paradise Estate. The Ederapolla and Halpe experiments were on buddings of clone PB 86 and the other on Tjir 1 selfed seedlings.

Hevea leaves from plants receiving Nitrogen, Phosphorus and Potassium and Magnesium at three levels, namely, treatments 0—0—0, 1—1—1, 2—2—2 and 3—3—3 were sampled for analysis.

The leaves were analysed for Nitrogen, Phosphorus, Potassium, Calcium and Magnesium and the results are reported in Table III.

TABLE III

Treatment	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium
Ederapolla. PB 86 buddings planted in 1957					
	%	%	%	%	%
0–0–0	2.44	0.09	0.45	0.68	0.14
1–1–1	2.55	0.12	0.57	0.52	0.14
2–2–2	2.95	0.09	0.63	0.60	0.20
3–3–3	2.75	0.14	0.70	0.65	0.15
Paradise. Tjir 1 seedlings planted in 1957					
0–0–0	3.39	0.16	0.75	0.43	0.07
1–1–1	3.05	0.21	0.75	0.55	0.07
2–2–2	2.91	0.13	0.75	0.63	0.08
3–3–3	3.10	0.14	0.55	0.65	0.07
Halpe. PB 86 buddings planted in 1957					
0–0–0	2.68	0.17	0.94	1.40	0.06
1–1–1	2.78	0.19	0.85	0.52	0.14
2–2–2	2.91	0.09	0.85	0.66	0.11
3–3–3	3.00	0.09	0.94	0.54	0.13

Level 1–1–1 = R. 4:6:5 + Magnesium. Recommended dosage.

N.B.—Nutrient content expressed as a percentage on the oven dry basis.

In the case of Ederapolla and Halpe experiments, both of which are on clone PB 86, there is an indication of higher Nitrogen content in the leaves with higher Nitrogen application.

At Paradise Estate, the control has the highest Nitrogen content. In this experiment planting rows follow the slope of the hill and the control plot is sited at the lowest point of the experimental area.

However, one point of interest in the Paradise results is the low Magnesium content in the leaves, irrespective of the treatment.

1.5. Clonal Variations in Nutrient Content.

1.51. Nutrient Content in the leaves of Glen 1 and PB 86:

Leaf samples from clones PB 86 and Glen 1 obtained from the budwood multiplication nursery at Nivitigalakele were analysed for Nitrogen, Phosphorus, Calcium and Magnesium. The results (average of ten samples) are reported in Table IV.

TABLE IV

	Nitrogen	Phosphorus	Calcium	Magnesium
	%	%	%	%
Clone PB 86	2.67	0.12	0.84	0.17
Clone Glen 1	3.30	0.10	0.88	0.23

N.B.—Nutrient content expressed as a percentage on the oven dry basis.

There appears to be significant differences in Nitrogen and Magnesium content of the leaves, based on the standard error from ten separate samples of each clone.

1.52. Nutrient content in the leaves of some new clones:

Attempts were also made to determine the nutrient content in the leaves of some new clones, including the R.R.I.C. series. Samples were obtained from one-year-old plants from the R.R.I.C. clonal trial on a commercial estate. The results are reported in Table V.

Judging from these preliminary results, it is evident that clonal variations in respect of nutrient content needs further investigation and is likely to be a factor that has to be reckoned with in advisory foliar analysis.

TABLE V

Nutrient Content in the leaves of some New Clones from R.R.I.C. Clone Trial on Eladuwa Estate

Clone	Nitrogen %	Phosphorus %	Potassium %	Calcium %	Magnesium %
PB 86 (Control)	3.10	0.09	0.78	0.84	0.16
TR 1548	3.04	0.13	1.02	1.06	0.13
AVROS 1734	2.69	0.15	0.67	0.86	0.16
RRIM 612	3.30	0.16	0.67	0.88	0.22
AVROS 2037	3.72	0.18	0.97	0.70	0.17
PR 254	2.77	0.13	0.70	1.02	0.14
PB 86 (Control)	3.09	0.13	1.01	0.88	0.11
WR 101	2.95	0.12	0.77	0.74	0.14
RRIM 602	3.12	0.15	0.93	1.06	0.20
PR 248	3.12	0.16	0.67	0.84	0.14
RRIC 61	3.17	0.15	0.69	0.98	0.19
RRIM 623	3.14	0.16	0.52	1.02	0.19
RRIC 76	3.20	0.15	0.64	0.78	0.16
RRIM 622	3.42	0.18	1.04	0.88	0.17
RRIC 75	3.24	0.16	0.92	0.72	0.13
RRIC 60	3.26	0.16	0.58	1.12	0.14
RRIM 603	2.98	0.14	1.02	0.68	0.13
TR 1542	3.34	0.18	1.08	0.76	0.13

N.B.—Nutrient content expressed as a percentage on the oven dry basis.

1.6. Soil Analysis:

Soil samples from eight estates were analysed in connexion with advisory work.

More samples have been analysed in connexion with the soil survey of the rubber growing districts. This is a long term programme, and to report on the results of analysis will be premature at this stage.

Six hundred soil samples, received from the Smallholdings Advisory Officer, taken from smallholdings in forty-one ranges in connexion with the combined soil and Fomes survey, were indexed and prepared for analyses. Gravel ($>$ 2 m.m. fraction) estimations, pH and moisture determinations have been completed on all samples. Particle size determinations have been completed on 100 samples and Nitrogen determination on 200 samples.

1.7. Miscellaneous:

The Department was called upon to analyse samples of Dolomite for Magnesium content.

Two proprietary fertilizers, namely "Ortil" and "PKN" (Rumianca Complex Fertilizers), were analysed for nutrient content in connexion with the field comparison trial.

Laboratory analyses were also done on 84 cover crop samples. These will be reported under the section on cover crop investigations.

2. Field Experiments.

2.1. Manurial Trials.

2.11. Dartonfield, 19½ Acres 1938 Clearing, 2 × 2 × 2 NPK Experiment:

The results of this experiment have been extensively reported in previous years. The final girth and yield records reported in the 1956 Annual Report showed that Phosphate continued to be essential for growth and yield. During 1957 it was decided to close down this experiment, and portions of the area were given over for building purposes. Early in 1958, this experiment was officially terminated and the area given over to the Estate Department.

2.12. Hedigalla, O, P, NP, PK and NPK Trial, 13½ Acres, 1952 Clearing, Manurial/Clone Trial:

In this experiment the above treatments are being tested in a Latin Square, each plot of which contains four clones: AVROS 255, PB 86 crown budded with LCB 870, PB 86 and LCB 870. Two manurial applications omitted in 1957, were given early in 1958, and brought up to date. The four applications for 1958 have also been given. Girth figures were taken during the year, and the results are reported in Table VI.

TABLE VI

Hedigalla 1958

Average Girths in inches

O	13.5	NP	18.0	PK	16.6	P	16.9	NPK	18.6
PK	16.4	NPK	17.9	P	16.4	NP	16.7	O	14.4
NP	17.8	PK	16.2	NPK	17.0	O	10.8	P	16.9
NPK	18.2	P	16.3	O	13.2	PK	16.8	NP	17.7
P	17.9	O	13.9	NP	18.0	NPK	18.2	PK	16.9

Treatment Mean:

O	13.2	
P	16.9	28%
PK	16.7	
NP	17.6	4%
NPK	17.9	7%

Critical difference between treatment means=0.946.

Here the response is 28% to fertilizer Phosphorus and 4% to Nitrogen in the presence of Phosphorus. Potassium in the absence of Nitrogen is slightly depressant and in the presence of Nitrogen is about 7% positive in its effect.

2.13. 3 × 3 × 3 NPK Trials:

Experiments of this design on Nakiadeniya, Padukka, Palmgarden, and Mahawala having been closed at the end of 1957 only two experiments, one at Paiyagalla and the other at Moneragalla, were in progress during 1958.

(*a*) Paiyagalla 3 × 3 × 3 NPK Trial, April 1955 Clearing.

Experiment commenced in September, 1956.

The manurial applications were maintained on this experiment. Girth figures taken in 1958 and their results are reported in Table VII, and the girth analysis in Tables VIII and IX.

TABLE VII

Paiyagalla 1958

Girths in Inches

		A				B			
		K_0	K_1	K_2		K_0	K_1	K_2	
	P_0	8.98	8.68	8.58	26.24	8.33	8.55	8.13	25.01
N_0	P_1	9.35	9.36	8.78	27.49	8.85	9.73	9.30	27.88
	P_2	8.73	9.05	8.80	26.58	9.10	9.28	9.50	27.88
		27.06	27.09	26.16	80.31	26.28	27.56	26.93	80.77
	P_0	9.40	9.10	9.23	27.73	8.68	9.15	8.75	26.58
N_1	P_1	8.95	9.13	9.85	27.93	9.83	9.31	8.75	27.89
	P_2	8.58	9.28	8.88	26.74	8.65	8.35	10.25	27.25
		26.93	27.51	27.96	82.40	27.16	26.81	27.75	81.72
	P_0	8.13	9.58	9.14	26.85	8.35	10.30	8.75	27.40
N_2	P_1	9.13	9.63	9.55	28.31	9.15	9.13	9.75	28.03
	P_2	8.05	8.83	9.80	26.68	8.98	9.45	8.88	27.31
		25.31	28.04	28.49	81.84	26.48	28.88	27.38	82.74

Block	1	80.56	Block 4	83.52
	2	83.71	5	82.54
	3	80.28	6	79.17
Total		244.55	Total	245.23

TABLE VIII

PAIYAGALLA 1958 (GIRTH ANALYSIS)

BLOCK A

	P_0	P_1	P_2		K_0	K_1	K_2			K_0	K_1	K_2	
N_0	26.24	27.49	26.58	80.31	27.06	27.09	26.16	80.31	P_0	26.51	27.36	26.95	80.82
N_1	27.73	27.93	26.74	82.40	26.93	27.51	27.96	82.40	P_1	27.43	28.12	28.18	83.73
N_2	26.85	28.31	26.68	81.84	25.31	28.04	28.49	81.84	P_2	25.36	27.16	27.48	80.00
	80.82	83.73	80.00	**244.55**	79.30	82.64	82.61	**244.55**		79.30	82.64	82.61	**244.55**

CF 2214.08

Total	26	5.24					
Blocks	2	0.80	0.40				
N	2	0.25	0.13				
P	2	0.85	0.42	5.54*	Linear	0.04	Quad. 0.81 F=10.57*
K	2	0.82	0.41	5.35*	Linear	0.61 F=7.96*	Quad. 0.21
NP	4	0.24	0.06				
NK	4	1.53	0.38	4.99*			
PK	4	0.29	0.07				
Error	6	0.46	0.08				

TABLE IX

BLOCK B

	P_0	P_1	P_2		K_0	K_1	K_2			K_0	K_1	K_2	
N_0	25.01	27.88	27.88	80.77	26.28	27.56	26.93	80.77	P_0	25.36	28.00	25.63	78.99
N_1	26.58	27.89	27.25	81.72	27.16	26.81	27.75	81.72	P_1	27.83	28.17	27.80	83.80
N_2	27.40	28.03	27.31	82.74	26.48	28.88	27.38	82.74	P_2	26.73	27.08	28.63	82.44
	78.99	83.80	82.44	**245.23**	79.92	83.25	82.06	**245.23**		79.92	83.25	82.06	**245.23**

CF 2227.32

Total	26	8.35
Blocks	2	1.16
N	2	0.21
P	2	1.37
K	2	0.64
NP	4	0.86
NK	4	0.77
PK	4	1.48
Error	6	1.86

The experiment on Block A gave significant responses to applications of Phosphate and Potassium and also a significant NK interaction, whereas the experiment on Block B gave no significant responses.

Block A Main effects. Critical Differences 0.905

$P_1 - P_0 = 2.91$	$K_1 - K_0 = 3.34$
$P_2 - P_0 = -0.82$	$K_2 - K_0 = 3.31$
$P_2 - P_1 = -3.73$	$K_2 - K_1 = -0.03$

Block A Interactions. Critical Differences 1.65

At N_0	$K_1 - K_0 = 0.03$
	$K_2 - K_0 = 0.90$
	$K_2 - K_1 = 0.93$
At N_1	$K_1 - K_0 = 0.58$
	$K_2 - K_0 = 1.03$
	$K_2 - K_1 = 0.45$
At N_2	$K_1 - K_0 = 2.73$
	$K_2 - K_0 = 3.18$
	$K_2 - K_1 = 0.45$

Unfortunately in this experiment complete randomization within blocks had not been adhered to. As a result of this, the error for the main N and K effects may be somewhat overestimated, and that of the main P effects may be somewhat underestimated.

2.13 (b) Moneragalla 3 × 3 × 3, NPK Trial, November 1956 Planting:

Two blocks one at Muppane Valley Division and another at Nakkala Division of Moneragalla Group.

Experiment commenced in January, 1957.

Planting material Tjir 1 seedlings underplanted in old rubber.

Manurial applications were given during the first half of 1958.

It had been noticed all along that the growth of plants in the experimental block at Muppane Valley was very poor. This was investigated and found to be due to the very sandy nature of the soil. In fact, a soil profile dug in the area indicated that this area might have been an old river bank at one stage. The poor growth of plants had also resulted in a number of vacancies and replacements.

In view of this unsatisfactory growth, this experiment was terminated in May, 1958, after a final inspection by the Director and the writer.

2.14. 4 × 4 × 4 NPK Manurial Trials:

There are five 4 × 4 × 4 NPK experiments of a new design, one each at Rilhena, Stokesland, Halpe, Ederapolla and Paradise estates. These experiments were commenced in 1957, the two experiments at Stokesland and Rilhena being on 1955 and 1956 replantings respectively and the rest on 1957 replantings.

The manurial applications for 1958 have been continued.

Girth figures taken in 1958 have been analysed. The girth figures and the girth analysis in respect of one of these experiments are reported in Tables X, XI and XII.

TABLE X

Halpe 4 × 4 × 4 Experiment

1958—Girths in inches

		N_0	N_1	N_2	N_3	K Totals
	K_0	2.46	2.75	2.79	3.75	11.75
	K_1	3.35	2.78	2.83	3.14	12.10
P_0	K_2	3.25	2.92	3.35	3.33	12.85
	K_3	3.20	3.23	3.68	3.29	13.40
	N Totals	12.26	11.68	12.65	13.51	50.10
	K_0	2.85	3.00	2.90	2.25	11.00
	K_1	3.00	3.55	2.75	3.25	12.79
P_1	K_2	3.04	3.71	2.97	3.22	12.94
	K_3	3.11	2.42	2.75	3.79	12.07
	N Totals	12.20	12.68	11.37	12.55	48.80
	K_0	3.00	3.68	3.25	3.58	13.51
	K_1	2.81	2.31	3.50	3.39	12.01
P_2	K_2	2.75	3.19	3.25	3.38	12.57
	K_3	2.71	3.19	3.21	2.75	11.86
	N Totals	11.27	12.37	13.21	13.10	49.95
	K_0	3.21	3.08	3.53	2.81	12.63
	K_1	2.47	3.78	3.45	2.86	12.56
P_3	K_2	2.83	3.42	3.20	3.25	12.70
	K_3	2.55	2.78	3.11	2.82	11.26
	N Totals	11.06	13.06	13.29	11.74	49.15

TABLE XI

Halpe 1958

Girth Analysis

	N_0	N_1	N_2	N_3	K Totals
K_0	11.52	12.51	12.47	12.39	48.89
K_1	11.83	12.42	12.53	12.68	49.46
K_2	11.87	13.24	12.77	13.18	51.06
K_3	11.57	11.62	12.75	12.65	48.59
N Totals	46.79	49.79	50.52	50.90	198.00

	P_0	P_1	P_2	P_3	K Totals
K_0	11.75	11.00	13.51	12.63	48.89
K_1	12.10	12.79	12.01	12.56	49.46
K_2	12.85	12.94	12.57	12.70	51.06
K_3	13.40	12.07	11.86	11.26	48.59
P Totals	50.10	48.80	49.95	49.15	198.00

	P_0	P_1	P_2	P_3	N Totals
N_0	12.26	12.20	11.27	11.06	46.79
N_1	11.68	12.68	12.37	13.06	49.79
N_2	12.65	11.37	13.21	13.29	50.52
N_3	13.51	12.55	13.10	11.74	50.90
P Totals	50.10	48.80	49.95	49.15	198.00

CF 612.5625

TABLE XII

Analysis of Variance (assuming there are four complete blocks)

Source	DF	S.S.	M.S.	F			
N	3	0.6518	0.2173	3.86*	Linear	0.5330	F 9.48**
					Quad.	0.1073	
					Cubic	—	
P	3	0.0734	0.0245				
K	3	0.2272	0.0757	1.34	Quad.	0.1444	F 2.56
NP	9	1.5016	0.1668	2.96	N Quad. P Linear	0.8904	F 15.81**
					N Linear P Cubic	0.3086	F 5.48**
					N Cubic P Cubic	0.1714	F 3.04
NK	9	0.2250	0.0250				
PK	9	1.5470	0.1719	3.05*	P Linear K Linear	0.8446	F 15.00**
					P Cubic K Quad.	0.4440	F 7.88**
Blocks	3	1.5432	0.5144				
Error	24	1.3507	0.0563				
Total	63	7.1199					

Coefficient of Variation 8%

Critical Differences of Main effect Totals=2.76

The linear response to N is significant.

Critical Differences of Interaction Totals=1.38

The quadratic effect of N on response to P is significant.

The cubic effect of P on response to N is significant.

The cubic effect of N on the cubic effect of P is significant.

The linear effect of P on the linear effect of K is significant.

The cubic effect of P on the quadratic effect of K is significant.

Of the two 4 × 4 × 4 experiments on two-year-old plants, the one at Stokesland showed responses to Phosphate and there was a significant PK interaction. At Rilhena there was a clear NK interaction. In these experiments the residual effects of previous fertilizers used will have to be accounted for. Of the other three experiments, the experiment on Paradise estate gave no results. This experiment was laid down in rows of rubber plants, planted in the direction of the slope of the hill and plots of ten trees which are contiguous have not been satisfactory. This may be the reason why treatment effects are nullified. At Ederapolla a response to N, P, K and a PK interaction have been observed. But, in view of the high percentage of supplies in this experiment, much importance cannot be attached to these results. At Halpe an N effect and the NP and PK interaction have been observed. These interim results at the end of one year's growth have to be interpreted with caution.

2.15. Experiment to investigate the effect of High and Low Potash Mixtures:

R 4:6:2, R 4:6:3, R 4:6:5 and R 4:6:8 Mixtures are being tested on six clones in a clone trial area of an August 1958 replanting of a collaborating Estate.

No manurial applications in the planting hole were given. The first manurial application was given in December, 1958.

2.16. 2 × 2 × 2 NPK Experiment (without the Nil level):

The first level is equivalent to the present R 4:6:2 and the second level is double that.

This is being tested in a 2 × 2 × 2 NPK Experiment laid down in a November 1958 replanting on the Kumbukkan Division of Kumarawatte Group.

No manurial applications were made in the planting holes and the first manurial application will be given in January, 1959.

2.2. Miscellaneous Field Experiments.

2.21. Hedigalla, 13½ Acres, 1952 Clearing, Clonal/Spacing Trial:

A trial of five clones with a restricted set of five planting densities from 110 to 220 points per acre. The clones used are PB 86, PB 86 top-budded with LCB 870, LCB 870, AVROS 255, and Kepitigalla polyclonal seed. The layout is that of 2 blocks each having five spacings. Across these are placed the five clones in randomized order, the entire trial occupying some 13 acres. The manuring of this experiment was done by the Estate Department. The girth figures taken in 1958 indicate generally that girthing was better in plantings of 125 and 154 points to the acre than in plantings of 109, 198 and 218 points per acre.

2.22. Proprietary Fertilizer Comparison Trial—Rayigam Estate:

Two proprietary fertilizers, namely, ORTIL and PKN (Rumianca Complex Fertilizers), at 2 levels are being tested against equivalent standard mixtures, R 4:6:2 and R 4:6:5 with and without Magnesium at 2 levels, at Rayigam Estate, Ingiriya.

The trial was commenced in late 1957. One block is in a 1955 replanting and another in a 1957 replanting.

The experiment in the 1955 block has suffered somewhat as a result of damage caused by slashing operation by unknown persons.

In 1958 Magnesium deficiency symptoms were noticed on plants receiving Rumianca fertilizers and the NPK mixtures without Magnesium.

The girth figures are summarized in Table XIII.

TABLE XIII

Rayigam 1958

Fertilizer Mixture	Girths in inches		Proprietary Fertilizer	Girths in inches	
	1955 Clearing	1957 Clearing		1955 Clearing	1957 Clearing
Usual dosage			Usual dosage		
R 215	9.05	2.55	ORTIL	8.29	2.25
R 215 + Mg	7.18	3.13	ORTIL	9.38	2.97
R 4:6:5	8.28	2.92	PKN	8.78	2.61
R 4:6:5 + Mg	8.09	3.00	PKN	7.53	2.86
Double dosage			Double dosage		
R 215	8.43	3.14	ORTIL	8.72	3.00
R 215 + Mg	8.48	2.75	ORTIL	8.08	2.73
R 4:6:5	7.50	3.30	PKN	8.78	2.75
R 4:6:5 + Mg	9.25	2.75	PKN	7.18	2.38

This experiment is a simple comparison and was not laid down on a statistical basis.

The effect of the different fertilizers is not very apparent on the 2-year-old plants.

In the 1957 clearing it would seem that the inorganic NPK fertilizer mixtures are somewhat better than the proprietary fertilizers.

The addition of Magnesium to the NPK mixture seems to have had a desirable effect at the usual dosage in the 1957 experimental area, whereas a negative effect is shown when the double dosage was given.

3. Soil Survey.

Attempts were made during the year to carry out a soil survey of a more detailed nature in a restricted area, the area selected being that covered by the one inch Alutgama Topographical Survey Sheet. Very little progress was made due to lack of adequate staff and facilities. With the appointment of a Field Assistant for Soil Survey in September, 1958, it is hoped to make some headway during 1959.

A soil survey was carried out in the 1958 replanted areas at Eladuwa and Kumarawatte before siting the blocks for the manurial trials on the two estates in order to avoid soil heterogeneity interfering with the validity of the experiment.

Soil samples from smallholdings covering the rubber growing areas in Ceylon were obtained with the collaboration of the Smallholdings Advisory Officer.

Altogether 600 soil samples from 164 smallholdings of the 41 ranges were sampled in a systematic manner and the samples received have been indexed for analysis.

4. Cover Crop Investigations.

4.1. Rhizobial strains for nitrogen fixation in leguminous cover crops—*Pueraria phaseoloides, Centrosema pubescens* and *Desmodium ovalifolium:*

It has been shown that Rhizobial strains QA 548 *b*, and QA 549, fix nitrogen in association with *Pueraria phaseoloides* in sand or vermiculite medium, and in Dartonfield soil in pots. A field trial was laid down at Nakiadeniya estate where the two strains were tested in a replanted area which had previously carried Pueraria, and on new clearing from "Kekilla" land definitely known to be Nitrogen deficient. The strains were tested on two cover crops, *Pueraria phaseoloides* and *Centrosema pubescens*.

In the replanted area, there was no difference in growth between inoculated and uninoculated Centrosema or Pueraria, whereas in the new clearing, inoculated Centrosema and Pueraria grew much better than the uninoculated controls. In fact, in the case of uninoculated Centrosema, plants died after germination, due to Nitrogen starvation, or remained stunted. It is probable that in the replanted area there were indigenous strains already present in the soil, which helped to fix nitrogen irrespective of the fact whether the new strains were introduced or not.

Since introduction of new rhizobial strains would be sufficient insurance against non-fixation of Nitrogen, arrangements are being made to multiply these strains for distribution to those who wish to introduce such strains when planting cover crops in replantings or new plantings. This was announced in the Combined 1st & 2nd Quarterly Circulars for 1958 and the requests for rhizobial cultures have been encouraging. Cultures have been distributed to eight estates.

4.2. Manurial:

The harvested aerial portions of plants obtained from the two pot trials initiated to study the effect of adding different nutrients on the growth of Pueraria and Centrosema, were chemically analysed with a view to get some idea of the uptake of nutrients by cover crops.

New trials were not initiated, due to lack of time consequent to Mr. Constable's resignation, and also due to the fact that the growth of plants in the renovated greenhouse was not satisfactory.

A suspicion that "Cascalite" (the material used for roofing) interfered with light penetration was confirmed when light intensity measurements were made with a "Lux" photometer. It was found that light intensity inside the greenhouse varied from one-fourth to one-tenth of the light intensity outside, depending on the time of the day.

TABLE XIV

Dry Matter Produced by Different Cover Crops and their Nutrient Content

	No. of Samples	Dry matter produced g/sq. ft. (single harvest)		Nitrogen %		Phosphorus %		Potassium %		Calcium %		Magnesium %	
		$\bar{x}$	S.E.	$\bar{x}$	S.E.	$\bar{x}$	S.E.	$\bar{x}$	S.E.	$\bar{x}$	S.E.	$\bar{x}$	S.E.
Pueraria phaseoloides	10	90.2	5.74	1.80	0.084	0.075	0.006	0.275	0.021	1.448	0.102	0.860	0.100
Centrosema pubescens	10	56.8	5.47	1.99	0.082	0.138	0.017	0.389	0.046	0.982	0.072	0.873	0.120
Desmodium ovalifolium	10	73.8	8.63	1.27	0.025	0.071	0.012	0.249	0.009	0.952	0.051	0.732	0.061
Mikania scandens	10	71.8	9.36	1.58	0.083	0.126	0.009	1.626	0.156	0.824	0.056	0.504	0.042
Tripsacum laxum (Guatemala)	5	330.0*	33.0	0.73	0.049	0.071	0.013	1.690	0.282	0.172	0.024	0.223	0.016

N.B.—Nutrient content expressed as a percentage on the oven dry basis.

The high amount of dry matter produced by Guatemala Grass (*Tripsacum laxum*) and the high Potassium content of Mikania scandens and Tripsacum laxum may be noted.

*The dry matter figure for Guatemala Grass is based on two samples.

The opinion of the National Institute for Agricultural Engineering also indicates that "Cascalite" is not a suitable material for roofing under conditions prevailing at Agalawatta.

4.3. Survey of Existing Covers.

In view of the fact that Guatemala grass is now grown on many estates between rows of rubber trees to provide readily available material for mulching, samples of Guatemala grass obtained from an estate in the Kalutara district have been analysed for its nutrient content, to be compared with that of other cover crops.

For comparative purposes, some of the results obtained are reported in Table XIV.

4.4. Field Experiment.

An experiment to study the effects of different legumes and common weeds, and fertilizer applications of Phosphate in the presence and absence of Nitrogen and Potassium, on the growth of young rubber, started in the Gallawatta 1957 Clearing, was in progress during the year.

The girth figures at the end of one year's growth have been analysed.

There was no significant difference due to the type of cover crop whereas NPK was significantly better than Saphos.

5. Weedkilling.

No fresh trials to test out weedkillers or weedicide mixtures were initiated. The effect of Amizole/PCP mixture on specific weeds was studied as a result of enquiries from estates. Since no attempt had been made to study the specificity of the weedkilling mixture recommended, efforts are being made to record the nature of effect of Amizole/PCP on the different weeds found in rubber growing districts.

REPORT OF THE CHEMISTRY DEPARTMENT

By

K. F. Heinisch

SUMMARY

The Chemist, Dr. E. J. Risdon, resigned his post in early May and the Research Assistant, Mr. M. Nadarajah, was on overseas study leave. The experimental and the advisory work of the Department has consequently been on a reduced scale.

Much of the time available has been devoted to continue the work started in 1957 on the subject of the limitation of contamination when dusting formulations are used to minimise defoliation due to Phytophthora palmivora. In this connexion our Information Leaflet No. C/58/1 describing the type of dust to be used, the rate of application, the method and time of dusting, etc. was circulated early in the year primarily to Agency Houses and to various estates which have assisted the Institute in the matter of supplying the relevant samples or of allowing certain tests to be carried out on these estates. Subsequently, on the basis of the results of the preliminary blending experiments carried out during the early part of the year, Information Leaflet No. C/58/2 describing the method of sampling in the field, the details of blending of scrap before processing and requesting the estates to send the relevant sub-samples of their blended material to the Institute for testing and further advice, was circulated in the same manner as Information Leaflet No. C/58/1, but the response was disappointing as most of the estates failed to comply with our request.

An appreciable number of estates have been visited to offer our advice regarding various manufacturing problems of both crepe and smoked sheet and regarding the prevention of precoagulation in the field.

Further work on R.S.S. milling output rates of a Guthrie 5-roller sheeting battery, with reference to the nature of the coagulum, the depth of latex in the coagulating tank and the r.p.m. of the individual rollers, commenced towards the end of the year and this work will be completed in 1959.

DETAILED REPORT

Section No. 1. General:

1.1. Staff.—The Department consisted of the Chemist, Dr. E. J. Risdon, the Research Assistant, Mr. M. Nadarajah, the Senior Technical Assistant, Mr. D. S. Muthukuda, three Technical Assistants, Messrs. M. T. Veerabangsa, G. G. Gnanasegaram and O. M. R. Sirisena, and four Minor Staff Officers. Five to fourteen labourers are made available to the Department as and when required. The Chemist resigned his post at the end of his contract in early May and Dr. K. F. Heinisch was appointed in his place as Rubber Chemist with effect from 29th December, 1958. The Research Assistant was on study leave throughout the year under a Colombo Plan Scholarship at the University of Birmingham, U.K. Mr.

O. M. R. Sirisena was appointed on probation as Technical Assistant in the Department with effect from 1st July, 1958. During the absence of the Chemist and the Research Assistant, the Senior Technical Assistant was responsible for the conduct of the Department under the general supervision of the Director.

Apart from normal periods of leave and sickness all other members of the permanent staff of the Department were on duty for the whole year.

1.2. Advisory Services and Correspondence, etc.—The table below gives a summary of much of the data relevant to this sub-section.

(*a*)	Unsolicited samples etc. submitted for report or test ...	48
(*b*)	Samples collected on Dartonfield Group in connexion with fungicide contamination experiments	1,320
(*c*)	Correspondence incoming	301
(*d*)	Correspondence outgoing handled by the Chemist ...	149
(*e*)	Correspondence outgoing handled by the Director ...	145
(*f*)	Duplicated letters, pamphlets and leaflets outgoing ...	4
(*g*)	Visitors to the Department	62
(*h*)	Visits by the staff of the Department (details below) ...	71

	R.R.I.C. Estates	Other Estates	Other Visits	Total
By Chemist ...	2	—	5	7
Senior Technical Assistant ...	22	15	2	39
Technical Assistants	11	3	4	18
Minor Staff ...	7	—	—	7

As previously, the figures in column No. 2 of (*h*) above exclude visits to Dartonfield Division (*e.g.* for the purpose of sampling in the fungicide contamination areas and in the latex concentration areas), and in all the figures a visit to more than one estate per day is classed as only one visit.

1.3. Publications.—The publications of the Institute issued during the year, to which members of the Department have contributed partly or *in toto*, include the Annual Report for 1957. Two publications on the contamination of natural rubber by fungicidal dusts have been issued in the form of Information Leaflets and one of them has been published in the Combined 1st and 2nd Quarterly Circulars for 1958. A further article on the "Choice and Application of Fungicides to Plantation Crops with Special reference to Hevea Brasiliensis" has been published in "Nature" (Vol. 181, 1958, pp. 1017–1018).

1.4. Miscellaneous.—Dr. Risdon attended a number of meetings of the Kalutara District Planters' Association. He also gave a talk on "Some Aspects of Natural Rubber Production Technology and Chemistry" to the Ceylon Section, Royal Institute of Chemistry, in May, 1958. The Senior Technical Assistant spent an appreciable period checking various inventories for audit purposes. The Technical Assistant, Mr. G. G. Gnanasegaram, was absent from duty for about one month due to the national emergency. Acknowledgement is made to the Technical Officers of the British Rubber Producers' Research Association in Welwyn Garden City for advice, comments and suggestions on certain technical matters.

Section No. 2. Latex:

2.1. Approximate Determination of the d.r.c. of Fresh Latex.—During the period under review there have been a limited number of enquiries concerning

means of avoiding a loss in the daily intake of rubber at the factory when the determination of each individual lot of incoming fresh latex is done by the metrolac. In this connexion it has to be noted by the users of the metrolac in Ceylon that this instrument should not be regarded as highly accurate under all conditions and was never intended to be. Probably the most suitable method of obtaining a more reliable estimate of the actual intake at the factory would be a trial coagulation of the bulks received from each Division. The Department also received further enquiries on this subject with special reference to (*a*) the possibility of tappers 'cheating' the metrolac by the addition of various adulterants to latex and to (*b*) the fact that with unstable and thick latex the metrolac is liable to 'stick'. In all such instances the Department assisted the estates concerned by testing the relevant samples of latex and by offering the necessary advice to overcome these difficulties.

2.2. Precoagulation.—From the nature of the advisory correspondence received on this subject and from the observations made by the officers of the Department during their advisory visits to outside estates it could be safely concluded that the low percentage of No. 1 crepe and smoked sheet on many estates was partly due to the delivery to the factory of latex which was far too unstable for proper working. Hence it is apparent that the relevant R.R.I.C. and R.R.I.M. literature on this subject has not been examined in detail. In this connexion, it would be appropriate to emphasize here that the concentrations of the anticoagulants suggested in the R.R.I.C. publications are only suggestions and not inflexible recommendations. The concentration or the dosage of the stock solution of the anticoagulant used depends on the extent of precoagulation which in turn depends on various factors such as the nature of the clone, the weather, the quality of the water used, the distance to the factory etc., and hence estates should carry out small-scale trials with anticoagulant mixtures to suit their own conditions. In general, the difficulties of most estates contacted in this connexion could be substantially diminished by the use of the anticoagulants in the shells, *i.e.* before collection.

The Department had very little opportunity of organizing trials with various anticoagulant mixtures as a means to prevent extensive precoagulation in the latex of slaughter-tapped trees. It is anticipated that more work on this subject will be carried out in 1959.

2.3. Preparation of Concentrated Latex.—Some attention has been given to the subject of small-scale preparation of concentrated latex mainly (*a*) for the purpose of training the newly appointed Technical Assistant in the analysis of calcium, magnesium and phosphate and in the determination of the mechanical stability in the centrifuge concentrate after varying periods of storage and (*b*) for purposes of demonstration.

Section No. 3. Smoked and Air Dried Sheet:

3.1. Coagulation.—During the year the Institute purchased from the Colombo Commercial Company two 90-partition continuous strip DCL coagulating tanks for sheet coagulation at Hedigalla Division. Coagulation trials were carried out with the object of ascertaining the optimum standardization figure, the depth of latex and the amount of coagulant required for the preparation of sheet coagulum for milling through a Guthrie 5-roller sheeting battery.

3.2. Milling.—The local manufacturers of the Guthrie Cadet Sheeting mill loaned a 5-roller sheeting battery for experimental trials of the Department. The installation of this mill was completed towards the end of the year and the experimental work on this subject will be completed in 1959.

3.3. Drying and Smoking.—The objectives of the work under this sub-section have been explained in detail in the previous reports. Very little attention has been given to the experimental work on this subject as the staff concerned have been rather fully occupied with routine type advisory work, particularly after the Chemist's resignation at the end of his contract in early May, 1958. Further work on this subject will be undertaken in 1959.

3.4. Rust on R.S.S.—This subject has been a main worry to most of the sheet manufacturing estates. During the course of the advisory visits to some of these estates, it was apparent that rust in smoked sheet was mainly due to the following:—

(*a*) Prolonged dripping of the wet sheets.
(*b*) Use of insufficient or no water during milling.
(*c*) Inadequate washing of the sheets after milling.
(*d*) Low temperature and bad ventilation in the smokehouse during the early stages of drying.

Section No. 4. Blanket Crepe:

4.1. General.—The volume of advisory work in this section is still quite considerable. In general, the major cause of correspondence and visits under this heading is the unexpected appearance of a substantial degree of discolouration in the dried laces or in the finished crepes manufactured on commercial estates. The advisory visits undertaken and the comprehensive reports and suggestions furnished by the Department have assisted the estates involved to overcome most of these difficulties.

4.2. Fractional Coagulation.—It has been observed on most estates that either the time taken to get the fraction formed or the size of the fraction is rather excessive, even in the presence of very small amounts of acid. In most cases the cause of the excessive fraction was due to the delivery of precoagulated or precoagulating latex at the factory. In order to accelerate the formation of the fractions, the Department carried out small-scale trials with Calcium Acetate. The results of these trials were quite promising but the examination of the dried fraction and the bulk of the final crepes obtained suggests that the added calcium can cause cure retardation in the A.C.S. 1 compound and means of overcoming this difficulty are still under examination.

4.3. Milling.—The low out-turn of No. 1 crepes on most of the estates visited during the year was partly attributed to improper milling conditions. It has often been found that certain crepe-producing estates did not have machinery provided for internal water cooling and, on the other hand in many cases where this type of machinery was available, the factory water supply was found to be inadequate. So that in either case milling was carried out on heated rollers which eventually caused a discolouration in the finished product.

It would also be appropriate to mention that certain estates were in the habit of over rolling their coagulum through the grooved mills. Under normal conditions a maximum of five to six rollings through the grooved mills under a good water spray are sufficient to wash out the serum substances and bring the rubber to a suitable form for passing through the smooth mills.

4.4. Crepe Drying.—With the increase in crops due to replanting a few estates have asked for advice from the Institute regarding ways and means of enlarging or improving their existing drying facilities. After a careful inspection

of the facilities available at these estates, suitable advice for the improvement of their drying systems was offered.

4.5. Fungal Spots on Crepe.—A part of the advisory correspondence dealt with by the Department and two visits by the R.R.I.C. Officers to outside estates during the year has been concerned with this subject. From the observations made during the officers' visits and from the nature of the correspondence received it was evident that the appearance of fungal spots on crepe had been mostly due to (*a*) retarded drying of the crepe laces in badly ventilated natural air-drying lofts especially during wet weather, (*b*) blanketing of the laces before they are quite dry, and (*c*) storing the finished rubber in damp surroundings.

Section No. 5. Compounded Rubber:

5.1. Equipment.—No major items of new equipment under this heading are outstanding. The second Mooney Viscometer to run on A.C. mains has been taken into use during this period.

5.2. Technical Classification of Ceylon Rubber.—As far as the Department is aware, the commercial position in Ceylon has remained substantially unchanged during the year and as such no immediate large-scale production of Technically Classified Rubber is anticipated in the near future, partly because the bulk of Ceylon's R.S.S. is shipped to China and partly because any large-scale commercial production of Technically Classified Rubber by packers would most probably entail expenditure over and above normal, *e.g.* for blended packing. The volume of experimental sampling and testing in this connexion has therefore been materially reduced.

5.3. Copper Content of Ceylon Rubber and the use of Copper Containing Fungicides.—Long term copper dusting experiments were carried out by the Department with the object of ascertaining (*a*) the suitability of rainguards as a means of preventing copper contamination in the latex and the scraps and (*b*) the effect of the controlled blending system already described in Information Leaflet C/58/2 when most of the scraps from these dusted areas are treated accordingly.

The experiments were laid out at Dartonfield Division on two fields of $13\frac{1}{2}$ acres and $6\frac{1}{2}$ acres respectively. Dusting with 4% Blidust was commenced on these fields in early April and was continued almost weekly until about the end of October. About 650 samples of scrap were collected from these areas under the different treatments and were analysed for their copper contents. The data obtained from these experiments are summarized in the table on page 79.

1958 DUSTING EXPERIMENTS AT DARTONFIELD GROUP

SUMMARIZED DATA

	Treatment	Sample Type	No. of Readings	$\overline{X}$ Mean	S D	% over 7.9 p.p.m. of copper	Highest Value	$\overline{X} + 5$ SD
I	Control	Shell scrap crepe (Processed)	56	2.39	1.05	0	0	7.64
		Panel scrap crepe (Processed)	53	2.99	1.07	0	0	8.34
II	4% Blidust with 2 rainguards per tree, on 13½ acres	Shell scrap crepe (Processed)	53	4.39	3.02	9.4	20.10	19.49
		Panel scrap crepe (Processed)	53	4.06	2.17	7.5	9.90	14.91
III	4% Blidust without rainguards on 13½ acres	Shell scrap (Unprocessed)	53	5.09	2.23	13.2	11.08	16.24
		Panel scrap (Unprocessed)	53	4.85	3.71	13.2	22.30	23.40
IV	4% Blidust without rainguards on 6½ acres	Shell scrap (Unprocessed)	55	8.11	7.86	27.3	43.85	47.16
		Panel scrap (Unprocessed)	55	4.19	2.33	7.3	12.70	15.84
V	4% Blidust without rainguards on 13½ acres, and on 6½ acres and treated according to blending system.	Scrap Blanket Crepe	210	3.22	0.95	0	0	7.97

Detailed examination of the summarized data suggests that the use of even two rainguards on each tree has not eliminated the risk of contamination in both shell and panel scrap samples collected. This may most probably be due to wind-borne contamination and ways and means of prevention of such contamination on a commercial scale are not yet known.

The comparison in the data between treatments III and V, and IV and V clearly indicates that the controlled blending of scraps collected from the dusted areas gives a substantial reduction in the extent of contamination, *i.e.* the percentage of samples which have copper contents above 8 p.p.m. and in the seriousness of contamination, *i.e.* the difference between the numerical value of the copper content of the contaminated sample and the specification limit of 8 p.p.m. The standard deviation of the copper content values of the 210 sub-samples of blanket crepe which were manufactured in accordance with the blending system has been appreciably reduced and the numerical value of the criterion ($\bar{\times}$ + 5 SD), *i.e.* mean + 5 times the standard deviation, is well below 10.

Hence it could be concluded that if the contaminated scrap collected from copper-dusted areas are treated according to the blending system mentioned in the Information Leaflet No. C/58/2 the standard deviation of the copper content values of such treated scrap can be appreciably reduced, *i.e.* the spread of the copper content of the individual small sub-samples about the true mean copper content of an invoice or batch will be reduced, so that the chances of a single random sample having a high copper content are reduced relatively.

5.4. Superior Processing Crepe.—Small-scale trials on the preparation of S.P. rubber were attempted during the year and it is anticipated that further work on this subject will be carried out in 1959.

5.5. Carbon Black Master-batches.—Some trials were carried out to produce carbon black master-batches by the addition of carbon black in the form of an aqueous slurry to latex, but these resulted in processes which were unsatisfactory for one reason or another. Mixing carbon black slurry with fresh latex or with ammonia-preserved or formaldehyde-preserved normal concentrated latex results in immediate coagulation in coherent lump form without intimate mixture of the carbon black and rubber, but the addition of fresh latex into a fine aqueous slurry of carbon black, with or without a dispersing agent and with hand stirring followed by mechanical stirring, results in a readily filterable slurry of particles of a rubber carbon black mixture. The rubber carbon black particles could be separated from the aqueous medium by filtration followed by drying at about 120°F for 2 to 2½ days in a drying chamber. The product obtained after drying was in a crumb form and could be rolled into a sheet similar to blanket crepe. Further trials on this subject will be carried out in 1959.

REPORT OF THE SMALLHOLDINGS DEPARTMENT

By

R. T. Wijewantha

SUMMARY

The work of the Smallholdings Department both in the field and office continued to increase during the year under review. Assistance to smallholders was in the form of advisory visits, lining for planting holes and soil conservation works. The organization and supervision of an increased number of co-operative sulphur dusting groups were again undertaken.

The Smallholdings Advisory Officer was on duty throughout the year. Mr. N. W. Palihawadana, the Senior Assistant Advisory Officer, retired on 1st October having served the Institute for over 10 years. Mr. H. H. Peiris, the Assistant Advisory Officer (South) was promoted Senior Assistant Advisory Officer and transferred to Smallholdings Headquarters in Colombo. Mr. D. E. A. Abeywickrema, District Field Officer (Galle), was promoted as Assistant Advisory Officer (South) with effect from 1st October, 1958. The vacant post of District Field Officer was filled by promoting a Rubber Instructor and posting him to Ratnapura.

Eleven Temporary Rubber Instructors and 2 clerks were recruited to fill vacancies in the Department. One temporary clerk was promoted as Clerk/Translator. Seven Rubber Instructors left the Department after securing more remunerative employment elsewhere.

The Headquarters of the Smallholdings Department was moved to 267/3, Galle Road, Bambalapitiya, on 3rd October, 1958, as the previous premises were found to be inadequate.

Loans for the purchase of vehicles were granted to 8 officers in the Department.

Rubber Instructors conducted 520 sheet-making demonstrations and 484 sq. ft. of brass mesh for strainers and 223 aluminium coagulating pans were sold at concession rates to smallholders. Instructors paid 2,625 advisory visits to smokehouses.

A stencil plate was designed departmentally for marking of tapping panels on trees reaching tappable girth, especially in the earliest subsidy replanted smallholdings. A sufficient number of these templates were constructed and distributed among the field staff.

Mr. W. Lloyd, United Nations Organization Rubber Expert in Burma and Thailand, followed the work of this Department in the office and the field from 4th to 6th March, and the Trade and Agricultural Delegation from China visited smallholdings on 13th and 14th May.

The fifth smallholdings folder on 'Manuring of Rubber' was published in both Sinhalese and English. The leaflet on Oidium was reprinted in both languages.

A detailed report on sulphur dusting of smallholdings in 1957/58 was submitted for publication in the Rubber Research Institute Quarterly Circulars.

The annual field day—devoted to a few lectures and intensive field training of staff in respect of important subjects pertaining to their work—was held at Matugama on 27th September.

All of the 5,919 smallholdings for which subsidy replanting permits had been issued by the Rubber Controller in 1958 were visited by Rubber Instructors. 21,766 visits were paid in all during the year to smallholdings including 11,240 made in respect of previous year's permit-areas. During the year Rubber Instructors and Assistants lined 4,181 acres in 2,998 holdings for planting holes and 3,196 acres in 2,376 holdings for soil conservation works.

One hundred and ninety-six visits were made by the field staff for the purpose of checking at random the planting material issued from various Commodity Purchase Depots. On two occasions during the 'Emergency Period' Rubber Instructors attended to the distribution of planting material from Depots.

4,595 preliminary inspections on suitability of holdings for issue of new rubber planting permits were made during the year.

Instructors and Assistants lined 649 acres in 451 holdings for planting holes and 557 acres in 420 holdings for soil conservation works in New Rubber Planting permit-areas. Rs. 7,208/64 were paid as soil conservation grants to 130 peasant-class permit-holders.

In keeping with the decision of the Ministry of Agriculture and Food, issue of planting material to new rubber planters free of charge or at subsidised rate, was withheld.

In addition to the normal advisory visits, 8,455 special inspections were undertaken at the request of the Rubber Controller.

In the follow-up survey on the incidence of Fomes in smallholdings it was found that a further 701 of the holdings planted during the period 1953–55 had subsequently been infected, raising the total percentage of infection to 30.3%.

4,781 acres in 1,471 holdings were sulphur-dusted successfully against *Oidium* in 1957/58. This sulphur dusting scheme, where sulphur dust was subsidised to the extent of half the value of sulphur, was formally inaugurated by the Honourable the Minister of Agriculture and Food at a ceremony on 11th February, 1958, at Kosgama.

Arrangements have been completed for the dusting of 6,200 acres in 67 Co-operative Groups during the dusting season 1958/59. It is anticipated that of this acreage about 75% will be provided with subsidised sulphur.

DETAILED REPORT

1. INTRODUCTION:

The work of the Smallholdings Department both in the field and office continued to increase during the year under review. Fairly large numbers of subsidy replanting and new-planting permits were again issued and the organization and super-

vision of an increased number of co-operative sulphur dusting groups were again undertaken. Assistance to smallholders was in the form of advisory visits, lining for planting holes and soil conservation works.

2. GENERAL:

Establishment.—The Smallholdings Advisory Officer was on duty throughout the year.

Mr. N. W. Palihawadana, the Senior Assistant Advisory Officer, retired on 1st October, 1958. Mr. Palihawadana had been in the services of this Department for over 10 years as its Senior Assistant and his retirement is a great loss to the Department and to the Institute. Mr. H. H. Peiris, the Assistant Advisory Officer (South), was promoted Senior Assistant Advisory Officer and transferred to Smallholdings Headquarters, Colombo. Mr. D. E. A. Abeywickrema, District Field Officer (Galle), was promoted as Assistant Advisory Officer (South) with effect from 1st October, 1958. The three Assistant Advisory Officers were on duty throughout the year.

Mr. J. D. S. Wickremaratne, Rubber Instructor, Pugoda, was promoted as District Field Officer and placed in charge of Ratnapura Division with effect from 1st October, 1958.

Mr. W. A. Austin Perera, Temporary Clerk, was promoted as Clerk-Translator with effect from 20th June, 1958.

The following new appointments were made:—

Mr. H. D. N. G. Seneviratne,	temporary Rubber Instructor	5-5-58
Mr. S. Panditharatne,	,, ,, ,, ,, ,, ,,	5-5-58
Mr. H. S. F. Fernando,	,, ,, ,, ,, ,, ,,	5-5-58
Mr. M. C. Samarasekera,	,, ,, ,, ,, ,, ,,	2-6-58
Mr. U. D. V. Gunasinghe,	,, ,, ,, ,, ,, ,,	5-8-58
Mr. K. de A. Gunawardene,	,, ,, ,, ,, ,, ,,	5-8-58
Mr. U. S. Somapala,	,, ,, ,, ,, ,, ,,	6-8-58
Mr. K. S. Kodikara,	,, ,, ,, ,, ,, ,,	6-8-58
Mr. G. P. G. Chootandasa,	,, ,, ,, ,, ,, ,,	6-8-58
Mr. D. L. Abeysinghe,	,, ,, ,, ,, ,, ,,	15-8-58
Mr. W. E. W. de Mel,	,, ,, ,, ,, ,, ,,	1-9-58
Mr. H. M. Punchibanda,	Clerk/Translator ,, ,, ,,	1-8-58
Mr. G. P. A. I. G. Pathirana,	temporary Junior Clerk ,, ,, ,,	1-9-58

All the new Rubber Instructors were given a course of practical field training on all aspects of rubber work at Nivitigalakele, Hedigalla and Matugama under the supervision of the Assistant Advisory Officer (South).

The following Rubber Instructors left the Department after securing more remunerative employment elsewhere:—

Mr. E. S. Kularatne,	Rubber Instructor,	Kamburupitiya	on 28-2-58
Mr. G. W. Jayawardene,	,, ,,	Eheliyagoda	,, 28-2-58
Mr. H. M. K. Fonseka,	,, ,,	Pitigala	,, 28-2-58
Mr. P. Thiviyanayagam,	,, ,,	Dehiowita	,, 28-2-58
Mr. Q. B. Marambe,	,, ,,	Mawanella	,, 28-2-58
Mr. H. M. H. B. Herath,	Extra Rubber Instructor		,, 9-5-58
Mr. K. de A. Gunawardene,	Temporary Rubber Instructor		,, 18-8-58

Mr. A. Ranatunge, Clerk-Translator, left this Department on 29-3-58.

The Headquarters of the Smallholdings Department was moved to 267/3, Galle Road, Bambalapitiya, on 3rd October, 1958, as the previous premises were found to be inadequate.

Loans.—Loans for the purchase of vehicles were granted to 8 officers in the Department.

Correspondence.—The following figures in regard to correspondence is an indication of the volume of work performed both in the field and office:—

General:

Inward	4,765
Outward	9,341

With Rubber Controller:

Inward	488 (including 427 packets of N.R.P. application, etc.)
Outward	8,259 (including 4,595 preliminary reports, 3,064 Final Inspection reports and 600 special reports).

From Field Officers to Permit-holders:

4,834 (not included in the above figures).

Sheet Improvement.—Rubber Instructors conducted 520 sheet-making demonstrations. 4,84$\frac{3}{4}$ sq. ft. of brass mesh for strainers and 223 aluminium pans were sold at concession rates. Instructors paid 1,017 and 1,608 visits to demonstration and ordinary smokehouses respectively.

Seventeen demonstration smokehouses were completed during the year.

Demonstrations.—In addition to the sheet-making demonstrations mentioned earlier, 183 tapping, 593 disease control and 384 miscellaneous demonstrations were given by the field staff.

Marking of Tapping Panels.—The earliest rubber replantings and several New Rubber Planting Scheme's smallholdings will be coming into tapping shortly.

A stencil plate was therefore designed by the author for marking of tapping panels on trees reaching tappable girth. Sufficient templates were then constructed and distributed to the field staff. Demonstrations were subsequently given to all field staff on method of using the templates and markers.

Visits.—Mr. W. Lloyd, United Nations Organization Rubber Expert in Burma and Thailand, followed the work of this Department in the office and the field from 4th to 6th March, and the Trade and Agricultural Delegation from China visited smallholdings on 13th and 14th May.

3. PUBLICATIONS:

The fifth Smallholdings Folder on 'Manuring of Rubber' was published in both Sinhalese and English. The leaflet on Oidium was reprinted in both languages. A detailed report on sulphur dusting of smallholdings in 1957-58 was submitted for publication in the Rubber Research Institute Quarterly Circulars.

4. FIELD DAY:

The written examination for selection of a District Field Officer from among the Rubber Instructors revealed that the scientific knowledge of Instructors was rather limited. It was therefore decided to have each year, an annual field day devoted to a few lectures and intensive field training of staff in respect of important subjects pertaining to their work.

The field day for this year was held on 27th September. In all 47 Instructors, 4 Replanting Assistants, 6 District Field Officers and the 2 Assistant Advisory Officers attended the training class.

Lectures.—The lectures were delivered by the author commencing at 8 a.m. All officers were required to take down notes of the lectures in their field books. The lectures according to schedule and the subjects discussed were:

1. Elementary morphology of the plant and its physiology.

2. Manuring, essential and trace elements required by a plant, and the reasons for using NPK Mixtures with and without Magnesium. Manuring technique.

3. Fixation of Nitrogen by aerobic, anaerobic and nodule bacteria and the use of leguminous covers.

4. Fixation of Atmospheric Nitrogen.

Field Demonstrations.—The weather proved to be very inclement and the demonstrations arranged for showing the treatment of Fomes infected plants by the use of Tillex, planting technique and the control of Phytophthora by spray treatment with Bordeaux mixture, had to be cancelled. Part of that morning was devoted to cover the rest of the field programme. At Narawila village, officers were shown all the possible defects in smallholders' sheet and instructed on how these defects could be avoided. A full scale sheet-making and rolling demonstration too was given and a 350 lb. smokehouse shown and its construction explained in detail.

After the rain-curtailed programme was completed, all officers returned to Tissa Central School, Kalutara and dispersed from there.

5. REPLANTING:

Considerable attention was paid by the staff in assisting the smallholders in replanting their permit-areas in accordance with the requirements of the Rubber Replanting Subsidy Scheme. The following replanting permits issued in respect of the year 1958 were in force at the end of the year:—

	No. of Permits	Acres	Roods	Perches
Estates over 100 acres ...	424	9,963	0	00
Estates between 10 to 100 acres	1,013	6,053	3	23
Smallholdings under 10 acres ...	5,919	8,033	0	14
	7,356	24,049	3	37

All of the above 5,919 smallholdings were visited by Rubber Instructors. 21,766 visits were paid during the year to smallholdings, including 11,240 made in respect of previous year's permit-areas. During the year Rubber Instructors and Replanting Assistants lined 4,181 acres in 2,998 holdings for planting holes and 3,196 acres in 2,376 holdings for soil conservation works.

One hundred and ninety-six visits were made by the field staff for the purpose of checking at random the planting material issued to replanting smallholders at various Commodity Purchase Depots. In all 26,700 plants were inspected during these visits. On two occasions during the 'Emergency Period' Rubber Instructors attended to the distribution of planting material from Depots.

6. NEW PLANTING:

Next to replanting work, Rubber Instructors devoted most of their time in visiting, advising and assisting Rubber New Planting smallholders. Each new area was visited and reported on by a Rubber Instructor before a permit was issued. 4,595 such reports were sent to the Rubber Controller. 3,375 new-planting permits covering 5,623 acres were issued during the year. 6,494 visits were made by the field staff for advice and lining. The condition in which the holdings were found at each visit and the work done or recommended were noted in a special record sheet. 3,064 Final Inspection reports and 600 special reports were sent to the Rubber Controller.

Instructors and Assistants lined 649 acres in 451 holdings for planting holes and 557 acres in 420 holdings for soil conservation works.

Soil Conservation Grant.—Rs. 7,208/64 were paid as soil conservation grants to 130 peasant-class permit-holders. All work was measured by Rubber Instructors and counter-checked by District Field Officers before payment.

Planting Material.—In keeping with the decision of the Ministry of Agriculture and Food, issue of planting material to new rubber planters free of charge or at a subsidised rate was withheld.

7. SPECIAL INSPECTIONS FOR RUBBER CONTROLLER:

Several special inspections were undertaken at the request of the Rubber Controller, in addition to the normal advisory visits.

Visits for Preliminary Reports ...	...	4,595
,, ,, Final Inspection Reports	...	3,064
,, ,, Special Reports ...	...	600
,, ,, Checking Planting Material	...	196
Total	...	8,455

8. WHITE ROOT DISEASE:

The Fomes Survey commenced in 1956/57, revealed that 19.2% of all holdings replanted between 1953 and 1955 were infected to some degree or the other by White Root Disease.

In the follow-up survey in 1957/58, it was found that, a further 701 of the holdings planted during the period referred to, had been subsequently infected (Table I) raising the percentage infection to 30.3%.

TABLE I

Smallholdings Planted 1953-1955		
D.F.O's Division	No. of holdings found to be infected at 1st Survey (1956/57)	Additional No. of holdings found to be infected at 2nd Survey (1957/58)
Kegalla ...	75	110
Avissawella ...	209	127
Colombo ...	27	17
Ratnapura ...	291	186
Matugama ...	505	198
Galle ...	94	63
	1,201	701

The same survey revealed that 341 smallholdings planted in 1956 and which were surveyed for the first time in 1957/58, also showed infection to some degree or other. (Table II).

TABLE II

D.F.O's Division	No. of holdings planted in 1956 showing infection at 1957/58 survey
Kegalla ...	20
Avissawella ...	42
Colombo ...	9
Ratnapura ...	115
Matugama ...	141
Galle ...	14
	341

This would mean that a total of 2,243 smallholdings (21.2%) replanted during the 4-year period of 1953 to 1956 are infected by Fomes. Every one of these holdings has been visited by the field staff of this Department and suitable advice given on treatment and control.

In 1958/59 the Fomes survey will be continued as a means of following up infection in these replantings.

Soil Survey.—A soil survey was undertaken by this Department to cover all ranges in 1958. Soils from different horizons of freshly exposed profiles were sampled in four three-year old subsidy holdings per range. These soil samples are being tested and analysed in the Soils Department. The main purpose of this survey, as far as this Department is concerned, is to work out any possible correlation between soil characteristics and Fomes infection.

9. SULPHUR DUSTING OF SMALLHOLDINGS:

1957-58.—Co-operative Sulphur Dusting of smallholdings has been carried out successfully during the last few years, under the guidance and directions of the Smallholdings Department of the Rubber Research Institute.

In view of the encouraging results obtained so far, the Rubber Research Board decided to expand this scheme to benefit a greater number of smallholders. More facilities were to be provided and it was proposed that an approximate extent of 5,000 acres be dusted against Oidium in the 1957/58 dusting season.

The Sulphur Dusting scheme was formally inaugurated by the Honourable The Minister of Agriculture and Food at a ceremony on 11th February, 1958, at Kaluaggala, Kosgama. A representative gathering of smallholders, group organizers and prominent local residents were present.

Although the procedure in previous years for sulphur dusting was to be followed, a few alterations were made in accordance with the author's suggestions incorporated in his Dusting Report for 1956/57. Each Group was requested to appoint a Machine Operator to attend to the day to day dusting and so relieve the Rubber Instructor of this routine work. Another point of difference was that sulphur was subsidised to the extent of half the value of sulphur for dusting of smallholdings *below* 10 acres in extent.

The proposed scheme was advertised in the Press by the usual notification in both Sinhalese and English. An attractive leaflet on dusting was also printed and issued to the field staff to be distributed with the application forms among smallholders.

By the end of October, applications were received at the Smallholdings Headquarters from 51 Groups and payment for sulphur dust, etc., requested from the group members on 8-11-57.

Owing to the low rubber prices, two of the Groups defaulted and were replaced by two new Groups, one at Neboda and one at Undugoda. Even in the rest of the Groups money was very slow in coming in. *Had it not been for the subsidy on the sulphur*, the scheme for 1957/58 would undoubtedly have failed completely.

TABLE III

DISTRIBUTION OF DUSTING GROUPS

District	No. of Groups 1956/57	No. of Groups 1957/58
Kalutara ...	8	15
Colombo ...	8	12
Kegalla ...	3	9
Ratnapura ...	5	6
Galle ...	4	6
Matara ...	2	3
Total ...	30	51

Fifty one Groups comprising 4,781¾ acres finally participated in the Scheme (Table I and Annexure I). Of this acreage, nearly 70% (3,356½ acres) were provided with sulphur at a subsidised rate. In all 1,471 holdings were dusted.

Dusting Operations.—As wintering was very late in 1957, dusting was delayed and commenced only on 31-1-58, *i.e.* one month later than in the last dusting season.

In several of the co-operative groups in the Kegalla and Avissawella divisions, wintering, though late, was followed by very rapid refoliation so that the new leaves matured rather fast. As a result the fifth round of dusting was unnecessary.

The first Group to complete its dusting was the one at Horawala where all work was completed by 14-3-58. The last group to conclude dusting was that at Kesbewa which completed all work on 26-4-58.

The cost of dusting (excluding cost of sulphur) remained almost the same, Rs. 5.06 as opposed to Rs. 4.97. The slight increase could be accounted for as extra payment for the Machine Operator.

Machine Operators on the whole were of great help to the Rubber Instructors. Routine dusting and also maintenance of the machines were satisfactorily attended to by these labourers. They reduced to a considerable extent the burden of work which the Rubber Instructors have usually to shoulder during a dusting season.

Results.—All smallholdings which came under the co-operative scheme were dusted successfully. Generally a marked difference could be noticed between dusted and undusted holdings, particularly in the Kalu Ganga Valley. In the majority of the dusted holdings there was no leaf fall at all. Those which wintered late showed slight spotting and a negligible amount of leaf fall. Adjacent undusted holdings, however, were heavily attacked.

The results of the dusting were so satisfactory that almost without exception the owners of dusted holdings expressed their desire to join this Scheme next year as well, provided the price of rubber did not drop further.

Summary

No. of holdings dusted	1,471
Acreage dusted	4,781¾
No. of dusting groups	51
No. of acres per machine (av.)	94
Size of smallest holding	¼ acre
Size of largest holding	48 acres
Average No. of holdings in a Group ...	29
Average size of a holding	3½ acres

The total of 4,781¾ acres in 1,471 holdings dusted in 1957/58, *constitutes the largest acreage of smallholdings to be dusted against Oidium in one season.*

1958-59.—In the proposals for co-operative sulphur dusting in 1958/59, it was stated that due to various factors, expansion of the scheme according to the earlier 5-year plan may be difficult. It was, however, hoped that with a special effort, it may be possible to extend the scheme by a further 25%. I am pleased to report that, with the co-operation of my field staff, it has been possible to achieve this target.

Several modifications and alterations of the dusting scheme were made in 1957/58. These have resulted in streamlining of dusting procedure and technique, so that throughout the dusting season the dusting scheme worked smoothly and according to plan. In 1958/59, therefore, no further major change has been considered necessary. The formation to co-operative groups, however, was initiated about one month earlier than in the previous year.

The sulphur dusting scheme was advertised in the Press by the usual notification in both Sinhala and English on 10th and 12th September, 1958. A propaganda leaflet on dusting and application forms were issued to Field Staff for distribution among interested smallholders about the same time.

The response from the public—except in the Kalutara District—was poor. Only intensive and local propaganda by the Field Staff enabled the formation of the required number of groups. Although applications were received from 69 groups at the start, only 67 were finally accepted. One group in the Kegalla District defaulted in making payments. In the Matara District several smallholders in two groups at Imaduwa and Ibbawala cried off. The remaining smallholdings in these two groups were then amalgamated to form the combined Imaduwa/Ibbawala Group.

The Groups were distributed as follows:—

Kalutara District	...	...	17
Colombo ,,	...	...	14
Kegalla ,,	...	...	15
Ratnapura ,,	...	...	9
Galle ,,	...	...	9
Matara ,,	...	...	2
Kandy ,,	...	...	1
	Total	...	67

In all 67 Groups consisting of 6,201 acres will participate in Co-operative Sulphur Dusting in 1958/59. Of this acreage 75% will be provided with sulphur at subsidised rate. In all about 1,881 holdings will be dusted. More genuine smallholders are now taking part in the scheme and the average number of holdings per Group has shown a steady increase during the last few years.

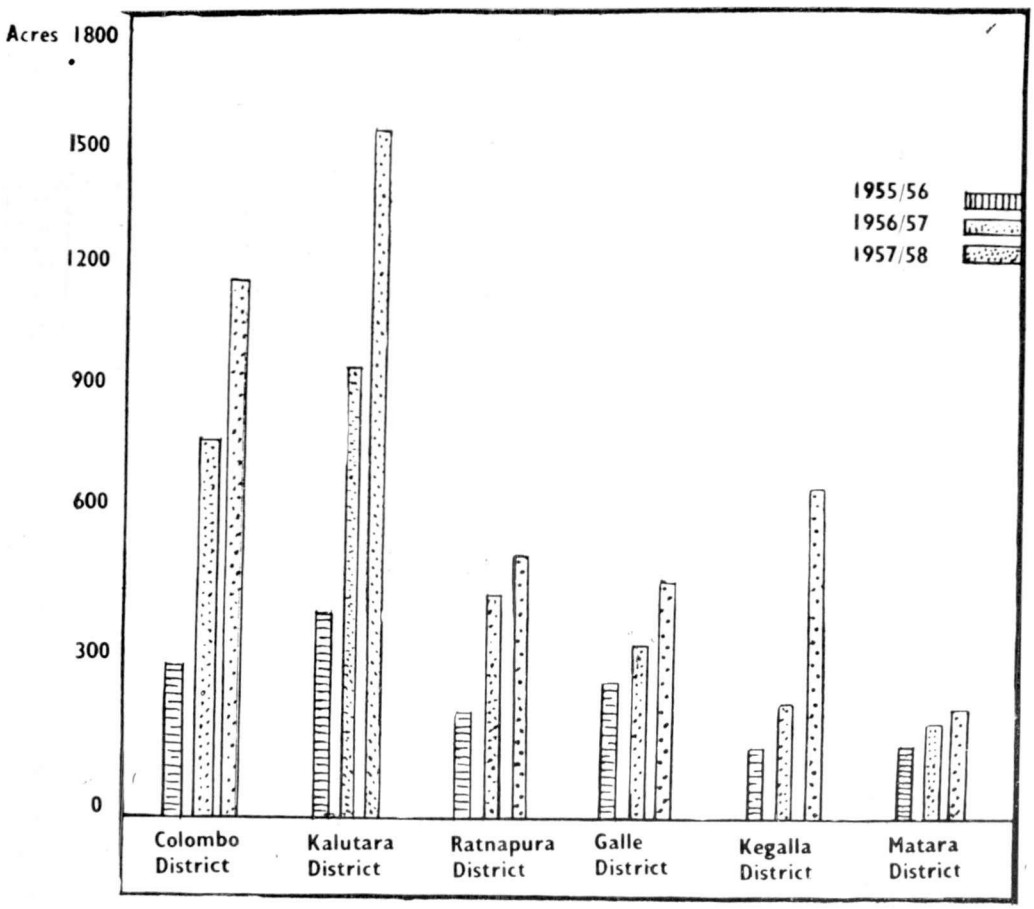
The distribution of dusting machines was commenced on 8-12-58 and completed by 16th December, 1958. Sulphur dust delivery orders were issued also on 8th December to various Groups. It was considered necessary to hold dusting demonstrations only in the newly formed Groups.

Detailed instructions were given to Field Staff on dusting methods by the author in early December. A confirmatory instructional leaflet was issued on 18th December, 1958.

In many cases during formation of the Groups difficulties arose, and it became necessary for the author to proceed to the spot and straighten out the problems. As in 1957/58, close supervision of dusting throughout the season has been arranged.

PROGRESS IN SULPHUR DUSTING OF SMALLHOLDINGS

1955/56—1956/57—1957/58



1955/56 Dusting Season — 1632¾ Acres
1956/57 —do— — 3119¾ „
1957/58 —do— — 4781¾ „

REPORT OF THE ESTATE DEPARTMENT

By

L. Wijeyagunawardene

SUMMARY

Dartonfield Group.—The Institute's stations at Dartonfield, Nivitigalakele and Hedigalla, in extent 1,491 acres, 0 roods and 30 perches, bear a planted acreage of 1,027, of which 384 acres 2 roods 36 perches were tapped during the year. At Hedigalla 77 acres were under nursery for the Rubber Replanting Subsidy Scheme.

Weather conditions were more favourable for tapping and for harvesting of crop than during the previous year. A higher rainfall was recorded, but the distribution was more even.

A very satisfactory crop of 264,024 lb., representing an average yield of 687 lb. per acre, was obtained. Both crepe and ribbed smoked sheet were manufactured. Advantage was taken whenever possible of price differentials obtaining for crepe and sheet in determining the type of manufacture.

The immature rubber acreage stood at 620 acres, 2 roods, 3 perches for the year.

The incidence of Oidium heveae was very light and presented no difficulty in the application of control measures. Sulphur dusting was carried out successfully resulting in an exceptionally fine foliage throughout the mature areas of the Group.

Phytophthora leaf fall was, however, more pronounced than last year; particularly on the division at Hedigalla with its heavy rainfall.

Control measures were adopted in dealing with root diseases in accordance with the Institute's recommendations.

Under "Exchange of Clones" budwood of Dothidella-resistant material was received from Liberia in February and in August. Budwood of nineteen RRIC clones and five other local clones was despatched to Florida in August and October.

Requirements of budded stumps of the RRIC series for small-scale clone trials on two outside estates and the Department of Agriculture were met. Budwood of the RRIC series of clones continued to be much in demand, and issues to estates and smallholdings were attended to.

Routine weeding, cultivation and other agricultural operations were carried out in all mature and immature areas of the Group. A record of the work during the year in connexion with the maintenance of buildings, new buildings, roads, power and water supply is shown in the body of the report.

The Rubber Replanting Subsidy Scheme Nursery at Hedigalla continued to be supervised throughout 1958. There was no increase in the acreage, which stood

at 77. The nursery was in full production. Approximately 154,000 Tjir 1 seedlings and 70,000 PB 86 budded stumps were issued from this Nursery during the year.

Estimates for 1959 connected with working of the Group, maintenance works of the Institute, field and factory experiments, etc. were prepared by the writer, and approved by the Rubber Research Board.

In connexion with Hedigalla Nursery an estimate for 1959 was prepared and submitted to the Rubber Replanting Advisory Board.

DETAILED REPORT

Visiting Agent.—Mr. C. A. C. Bowen paid two visits to the Institute's properties during the year. Reports on these visits were submitted to the Rubber Research Board.

Superintendent.—The writer was on duty throughout the year.

Assistant Superintendent.—Mr. Douglas de S. de Fonseka assumed duties with effect from 1-6-58. He is stationed at Hedigalla.

Staff.—Subject to the following changes, the Department's staff remained the same.

Mr. H. M. Buultjens who had been seconded for service as Nursery Manager, R.R.S.S. Nursery at Hedigalla, reverted to his substantive post with effect from 10-2-58.

Resignations.—Mr. D. J. Jayasinghe, Field Attendant, Agronomy Department, resigned on 19th September, 1958.

New Appointments.—Mr. U. K. D. Lewis succeeded Mr. D. L. M. Goonewardena as Field Assistant, Agronomy Department, with effect from 2-1-58 when the latter assumed duties as Technical Assistant.

Mr. A. K. Somapala, Motor Mechanic, with effect from 1-1-58.

Mr. B. D. Seemon, Assistant Engine Driver, with effect from 1-2-58.

Mr. N. W. Piyasena, Motor Vehicles Driver, with effect from 1-2-58.

Mr. W. M. A. Albert, Assistant Engine Driver, with effect from 20-2-58.

Mr. A. B. Wickremaratne, Motor Vehicles Driver, with effect from 29-4-58.

Mr. N. L. D. Piyadasa, Factory Attendant, Hedigalla, with effect from 1-7-58.

Mr. S. D. Jayaweera, Field Assistant, Soils Department, with effect from 17-10-58.

Mr. B. Ranasinghe, Field Attendant, Soils Department, with effect from 15-12-58.

The cadre of the Estate Department stands at 51 made up as follows:—

Senior Staff	...	1
Intermediate Staff	...	1
Assistant Staff	...	22
Minor Staff	...	27

Acreage Summary—Dartonfield Group:

Rubber	Dartonfield			Nivitigalakele			Hedigalla			Total		
	A.	R.	P.	A.	R.	P.	A.	R.	P.	A.	R.	P.
Mature	96	1	21	131	1	19	156	3	36	384	2	36
Immature	46	1	00	20	0	08	554	0	35	620	2	03
Nurseries	5	2	00	16	1	00		—		21	3	00
Total Rubber	148	0	21	167	2	27	711	0	31	1,026	3	39
Abandoned due to wind damage, etc.		—		2	0	04		—		2	0	04
Building sites	23	1	34	1	0	28	8	0	34	32	3	16
Pinewood Plantation		—			—		1	0	34	1	0	34
Roads	6	2	22	0	3	27	9	0	04	16	2	13
Swampy Areas		—		0	2	08	0	2	20	1	0	28
Streams and Reservations ...	0	0	29		—		13	0	29	13	1	18
Jungle, etc.		—		1	3	38	395	0	00	396	3	38
Total ...	178	1	26	174	1	12	1,138	1	32	1,491	0	30

The total cultivated acreage of the Group was 1,027 acres by the end of the year as against 1,026 acres the previous year. The one acre increase is due to the establishment of a Budwood Nursery at Dartonfield. The acreage in full bearing increased from 352 acres, 3 roods in 1957 to 384 acres, 2 roods, 36 perches in 1958.

Weather (Estate Gauge).—Comparative rainfall figures for 1957 and 1958 are shown below:

Month	Dartonfield		Nivitigalakele		Hedigalla	
	1958	1957	1958	1957	1958	1957
January	8.64	2.66	10.80	1.10	10.25	4.01
February	5.10	7.96	7.70	9.10	10.11	10.27
March	13.05	8.26	15.30	7.50	19.25	4.32
April	12.49	12.53	11.55	11.46	15.88	21.92
May	23.28	20.85	22.30	18.03	26.34	20.31
June	18.33	15.83	19.50	14.06	25.51	20.06
July	4.96	11.22	6.25	13.19	7.04	12.40
August	8.43	7.37	8.35	5.53	13.44	11.23
September	6.46	1.19	5.95	2.70	7.19	3.63
October	23.52	13.65	23.85	13.63	27.28	18.11
November	10.46	21.95	14.87	23.15	16.70	33.27
December	14.91	23.30	9.89	20.85	22.78	21.56
Total ...	149.63	146.77	156.31	140.30	201.77	181.09
Average (5 year period)	163.52″		157.13″		194.74″	
Total No. of Wet days	207	179	149	139	242	234

The rainfall for the year at Dartonfield, Nivitigalakele and Hedigalla Divisions amounted to 149.63″, 156.31″ and 201.77″ respectively. Although there were more wet days than last year, the rainfall was more evenly distributed. Hedigalla Division registered a notable increase of 20 inches over last year. The South-West monsoon set in as was normally expected but the North-East was not so pronounced.

Crop.—A very satisfactory crop was harvested for the season.

		1958	1957
Estimate	...	250,000	200,000
Harvested	...	269,399*	229,454
Excess	...	19,399	29,454

*This includes 5,375 lb. received from other estates as test tapping biscuits, etc. The actual amount harvested, therefore, is 264,024 lb.

COMPARATIVE YIELD RECORDS OF INDIVIDUAL FIELDS

Dartonfield	Acreage in tapping	Total yield in lb. 1958	Total yield in lb. 1957	Yield per acre 1958	Yield per acre 1957
1934 Replanted Area ...	7½	8,119	9,449	1,082.5	1,259.9
1936 ,, ,, ...	9½	6,562	6,742	690.7	709.7
1938 ,, ,, ...	18	15,986	15,340	888.1	786.7
1939 ,, ,, ...	2	1,654	1,547	827.0	773.5
1941 ,, ,, ...	6½	4,898	5,546	753.5	853.2
1947 ,, ,, ...	10¼	8,670	7,501	845.8	731.8
1950/51 ,, ,, ...	25¾	11,713	5,084	454.8	197.4
1952 (Part) ,, ,, ...	17	4,109	—	241.7	—
	96½	61,711	51,209	639.5	632.2
Nivitigalakele					
1926 Replanted Area ...	13	8,226	7,798	632.7	599.8
1927 ,, ,, ...	9¾	7,992	7,474	819.6	766.6
1928 ,, ,, ...	10½	7,486	6,716	712.9	639.6
1935 ,, ,, ...	30½	23,619	21,949	774.4	719.6
1939 ,, ,, ...	10¼	9,986	10,123	974.2	987.6
1940 ,, ,, ...	9¾	9,484	8,198	972.7	840.8
1940 Swamp Area ...	3¼	4,444	3,715	1,367.4	1,143.1
1941 Clearing ...	7	8,283	7,704	1,183.3	1,110.6
1942 ,, ...	4½	5,516	4,388	1,225.7	975.1
1943 ,, ...	7	4,852	4,105	693.1	586.4
1944 ,, ,, ...	4½	5,027	4,300	1,117.1	955.6
1946 Replanted Area ...	21	26,816	25,406	1,276.9	1,209.8
	131	121,731	111,876	929.2	854.0
Hedigalla					
1943 Clearing ...	10¼	8,146	7,650	794.7	746.3
1944 ,, ...	11¾	8,417	7,688	716.3	654.3
1945 ,, ...	22¼	13,191	9,753	592.8	438.3
1946 ,, ...	12¾	9,476	8,216	743.2	644.4
1947 ,, ...	45	26,013	20,428	578.1	453.9
1949 ,, ...	34¾	11,795	8,171	339.4	235.1
1950/51 ,, ...	20	3,544	1,000	177.2	250.0
	156¾	80,582	62,906	514.1	446.9

Total for the Group ...	384¼	264,024	225,991	687.1	652.9
T.T. biscuits from outside estates ...	—	5,375	3,463		
	384¼	269,399	229,454		

Tapping.—(*a*) Tapping was resumed, after rest during refoliation, on the 10th, 17th and 3rd March at Dartonfield, Nivitigalakele and Hedigalla respectively.

During the resting period, tapping panels were marked with the appropriate bark consumption in keeping with the system of tapping adopted on the various experimental clearings.

(*b*) Yields of fields in general are in order. Considerable decrease in yield in the 7½ acre and 6½ acre fields at Dartonfield were due in the 7½ acre field to the V/2 d/2 cuts on ladder tapping approaching the old tapping panels and in the 6½ acre field to loss of trees due to wind damage.

(*c*) Tapping conditions at Hedigalla Division left much to be desired due to the heavy rainfall of 200″ per annum. A loss of twenty-five tapping days was noted, when compared with the other divisions.

Analysis of tapping rounds on Dartonfield for 1958 (1957 figures in brackets).

	Early tapping		Late tapping		Resting		Rain		No tapping Holidays	
1st Quarter	61	(59)	1	(—)	23	(30)	1	(—)	4	(1)
2nd Quarter	33	(56)	23	(18)			31	(11)	4	(6)
3rd Quarter	69	(58)	14	(27)			9	(7)	—	(—)
4th Quarter	54	(35)	26	(46)			10	(11)	2	(—)
	217	(208)	64	(91)	23	(30)	51	(29)	10	(7)

Manufacture.—A summary of the various forms of manufacture during the year is given below:—

Latex Grades	Total in lb.	Percentage
Smoked Sheet No. 1	10,902	4.04
,, ,, No. 2	240	.09
Pale Crepe No. 1	142,621	52.94
,, ,, No. 2	24,741	9.18
,, ,, No. 3	35,634	13.23
Latex for experiments ...	505	.19
	214,643	79.67
Scrap Grades		
Scrap Crepe No. 1	44,952	16.69
,, ,, No. 2	8,890	3.30
,, ,, No. 3	416	.16
Scrap for experiments ...	498	.18
	54,756	20.33
Grand Total	269,399	100.00

Increasing difficulties are envisaged in the manufacture of uniform No. 1 crepe as the Hedigalla crop increases. This is mainly due to the variation in latices obtained from the numerous clones under experimentation.

Estate Roads.—These were maintained in good condition throughout the year.

Manuring.—Due to poor market conditions, the manuring programme of the year was revised. All mature areas received their quota of manure accordingly.

Weeding.—The mature areas were well weeded and maintained in good order.

PESTS & DISEASES:

Oidium heveae.—The unusually heavy rains in the closing months of the previous year led to a comparatively late wintering season. The leaf fall was however not protracted. The application of control measures against the spread of a mild attack of Oidium presented no difficulty.

Sulphur dusting operations were carried out successfully resulting in an exceptionally fine foliage, throughout the mature areas of the Group.

Phytophthora palmivora.—As was anticipated, the rains in late May and June gave a fillip to the spread of Phytophthora leaf fall. Purely as a precautionary measure, a round of Copper Sandoz dusting confined to areas susceptible to Phytophthora was carried out prior to observation of leaf fall. Normal dusting rounds followed. Although control measures were effective, Dartonfield and Nivitigalakele Divisions experienced more loss of leaf than the previous year due to the heavy canopy of leaf.

At Hedigalla Division on the older mature clearings under tapping, the leaf fall was not marked and was confined to scattered pockets throughout the fields. Normal dusting rounds were carried out and the measures taken were effective.

Sustained infection in pockets in the 1950/51 clearing in its first year of tapping, despite regular rounds of Copper dusting, caused much concern. The focus of infection was traced to an immature five-acre contiguous block planted with clone LCB 870 where the trees bore fruit prolifically, thereby acting as a source of infection.

Bark Rot.—(*a*) Applications of the water-miscible phenolic disinfectant Brunolinum Plantarium and of S.V. Treseal were made to tapping cuts in wet and dry weather respectively.

(*b*) The Phytophthora attack in the 1950/51 clearing at Hedigalla resulted in an increase of Bark Rot on the tapping panels. Tapping was stopped on the badly affected trees. Control measures were adopted, tapping panels scraped where necessary, and application of Kankerdood made. All trees susceptible to Bark Rot received regular applications of Antimucin.

Root Diseases.—Fomes lignosus, Ustulina zonata, etc. A few scattered cases of these diseases were found on the mature areas and routine measures of control were adopted. Details of loss of trees due to various causes were given in the monthly reports of this Department.

Thinning out.—A further round of thinning out in all areas of the Group where the plantings are over three years of age was effected.

Capital Account—Agricultural Development:

Dartonfield Division—Immature Replanted Areas

1952	Replanted Area	17¼	
1953	,, ,, ...	11½	
1953	,, ,, ...	5	(Planted in 1956)
1954	,, ,, ...	7¾	
1955/56	,, ,, ...	4¾	
		46¼	

Nivitigalakele Division—Immature Areas

1953	Clearing	10
1954	,, ...	10
		20

Hedigalla Division—Immature Areas

1952	Clearing	79½
1953	,, ...	142
1954	,, ...	177½
1955	,, ...	78
1956	,, ...	60
1957	,, ...	17¼
		554¼

1954 Clearing, Hedigalla—177½ acres.—This clearing which received special monthly applications of manure the previous year due to retarded growth, has now improved considerably and is on par with the rest of the fields.

1957 Clearing, Hedigalla—(N.E. Planting).—This area was surveyed in the course of the year and its extent found to be 17–1–10 acres.

Routine weeding, cultivation and other agricultural operations were carried out. The immature areas are in good condition and were maintained up to the required standards of agricultural practice.

Trees Uprooted

Dartonfield	Mature Areas	1952	1953	1954	1955/56
Fomes lignosus ...	23	—	1	11	6
Pink disease ...	1	—	—	—	—
Wind damage ...	109	—	4	5	9
Fomes noxius ...	4	—	—	—	—
Building sites ...	363	—	—	80	—
	500	—	5	96	15

Nivitigalakele	Mature Areas	1953	1954
Ustulina zonata ...	12	—	—
Brown Bast ...	20	—	—
Bleeding canker ...	5	—	—
Wind damage ...	53	—	—
Fomes lignosus ...	2	2	4
Bark rot ...	16	—	—
Building site ...	1	—	—
	109	2	4

Hedigalla	Mature Areas	1952	1953	1954	1955	1956
Fomes lignosus ...	7	9	108	122	24	—
Fomes noxius ...	8	18	32	9	10	—
Wind damage ...	26	1	8	1	—	—
Porcupine damage ...	—	—	—	10	—	—
Sun-scorched ...	—	—	—	—	—	37
Thinning out ...	—	34	85	558	23	—
Bleeding canker ...	12	—	—	—	—	—
	53	62	233	700	57	37

NURSERIES:

Upkeep and Establishment of Seedling and Budwood Nurseries—Dartonfield Group:

Routine operations of weeding and clearing of drains were carried out in all the nurseries. The plants were manured regularly in accordance with the Institute's recommendations.

Dartonfield—Seedling Nurseries.—Vigorous growing stocks in the seedling nurseries were selected and budded with the more promising RRIC clones as supply material to the newly established budwood nursery at Dartonfield.

Budwood Nursery.—A one-acre budwood nursery was opened at Dartonfield. This nursery was planted with approximately 50 budded stumps each of twenty-five RRIC clones and of fifteen of the imported clones most in demand.

Nivitigalakele—Seedling Nurseries.—(i) The vigorous growing stocks in these nurseries were budded to meet the following requirements:—

(*a*) 2,400 budded stumps to Department of Agriculture.
(*b*) 96 ,, ,, ,, St. George Group.
(*c*) 2,776 ,, ,, ,, Eladuwa Estate.

(ii) **Twinned-Seedling Nurseries.**—These were maintained in good order.

Establishment of "Exchange" Clones.—(*a*) 396 budding successes were obtained in January of the Dothidella-resistant clones received from the Plant Introduction Station, Florida, U.S.A., in December, 1957.

(*b*) Ninety eight buddings were made of clones Harbel 1, CT 95 and ST 71 received from Liberia in February.

(*c*) Four hundred and fifty one buddings were made of Dothidella-resistant IAN clones received from Liberia in August.

BUDWOOD DISTRIBUTION.—3,040 yards of budwood of various clones were sold to estates and smallholdings and one yard each of nineteen RRIC clones and of six local clones were despatched to Florida, U.S.A. on an exchange basis.

FIELD AND FACTORY EXPERIMENTS: The Chemistry, Botany, Plant Pathology and Soils Departments were given assistance in carrying out their field and factory experiments.

LABOUR AND HEALTH: Labour was settled and adequate for work done this year. Line room accommodation was satisfactory. Wages were paid during the year in accordance with the Wages Boards Ordinance in force.

DARTONFIELD GROUP:

Working Ceylonese		Resident	Non-resident	Total
Men	...	107	165	272
Women	...	80	68	148
Children	...	—	—	—
Working Immigrants				
Men	...	37	—	37
Women	...	28	—	28
Children	...	—	—	—
		252	233	485

Annual Holidays.—Annual holidays with pay were given to all labourers who were entitled to these in accordance with the Ordinance.

Maternity Benefits.—Twenty six full maternity benefits and 3 medical wants benefits payments were made.

Feeding Children and Milk Foods.—Free rations and $\frac{1}{4}$ lb. of bread were issued to each non-working child. Milk foods were issued to all infants whose mothers were incapable of nursing them.

Health.—The health of the members of the Institute's staff and of the estate labourers was satisfactory during the year.

Anti-Mosquito Measures.—DDT/Gammexane spraying was carried out throughout the year at regular intervals in and around the bungalows and lines under the supervision of the Apothecary.

Births.—Twenty nine children were born during the year on the Group.

Deaths.—There were 3 deaths on the Group this year.

A list of diseases treated by the Institute's Apothecary is given below:

Influenza	423
Ulcers	72
Ankylostomiasis	70
Other intestinal parasites	61
Other diseases	1,470
Total ...	2,096

MAINTENANCE OF BUILDINGS ETC.—REVENUE ACCOUNT

General Buildings.—The Offices and Laboratories were colour washed and minor repairs where necessary were effected.

Bungalows.—All Senior, Intermediate and Assistant Staff Bungalows were maintained in good order. All bungalows due for colour washing, etc. were done in the course of the year and repair works wherever necessary were attended to.

Cottages.—All cottages within the Group were maintained in good condition. Extensive repairs to roofs of labourers' cottages at Dartonfield were effected.

Water and Power Supply.—A very satisfactory standard was maintained.

Bungalow Furniture.—The unserviceable articles rejected by the Institute's Board of Survey were replaced during the year and repairs too were effected where necessary.

Motor Vehicles.—An Austin Gipsy, a Fiat "600" Saloon and an Austin $2\frac{1}{2}$ ton lorry were purchased during the year.

Machinery.—Messrs. H. W. Hammond & Co., Consulting Engineers, visited the Institute on 24th and 25th of March, 1958 and inspected all machinery and power plants. Their report on this inspection was submitted to the Rubber Research Board. The Visiting Engineers' recommendations were implemented.

Power Plant.—The Institute's Power Plant is comprised of the following:—

Dartonfield Division.—(*a*) 80/90 B.H.P. National Engine with a V belt driven 55 K.W. 230 Volts Compound Wound Generator.

(*b*) 240 B.H.P. Blackstone Four Cylinder Vertical Diesel Oil Engine direct coupled to a D.C. 180 K.W. 230 Volts Compound Wound Generator.

(*c*) 40 B.H.P. Lister Four Cylinder Vertical Diesel Oil Engine direct coupled to a 24 K.W. 230 Volts Compound Wound Generator.

Nivitigalakele Division.—(*a*) 5 B.H.P. Vertical Four Stroke National Oil Engine with a V belt driven $2\frac{1}{2}$ K.W. 230 Volts D.C. Generator.

(*b*) Twin Engines of 12 H.P. 2 YB. Ruston Vertical cold start engines direct coupled to 10 KVA. 400/230 Volts 1500 R.P.M. 3 phase 4 wire alternator.

Hedigalla Division.—20 B.H.P. Gardner Single Cylinder Horizontal cold start with a V belt driven 12 K.W. 230 Volts Generator.

The items mentioned in the previous page were maintained in good order.

Fuel Consumption:

	Average per hour
80/90 B.H.P. National Engine	
Liquid Fuel	2.36 gallons
Lubricating Oil	.25 ,,
40 B.H.P. Lister Engine	
Auto Diesel	1.36 gallons
Lubricating Oil	.12 ,,
240 B.H.P. Blackstone Engine	
Liquid Fuel	3.36 gallons
Lubricating Oil	.50 ,,
5 B.H.P. National Engine (Nivitigalakele)	
Liquid Fuel	.75 gallons
Lubricating Oil	.08 ,,
12 B.H.P. 2 YB. Ruston Vertical Engine (Nivitigalakele)	
Auto Diesel	.25 gallons
Lubricating Oil	.01 ,,
20 B.H.P. Gardner Engine (Hedigalla)	
Liquid Fuel	.75 gallons
Lubricating Oil	.06 ,,

Factory Machinery.—There were no additions to the factory machinery. All machinery were maintained in good order.

6 N.H.P. Vertical Cross Tube Cradley Boiler.—This boiler worked satisfactorily throughout the year.

Smoke-House.—The direct fired Air Heater was installed by Colombo Commercial Co., Ltd., together with an Alcosa Blower and a 4 B.H.P. electric motor worked satisfactorily.

Battery House.—The Alkaline N.I.F.E. battery of 200 cells (capacity 110 Amp. hour) was maintained in good order.

Water Pumps.—(*a*) The three 4″ × 5″ double acting Horizontal Myres pump driven by 5 B.H.P. motor were maintained in good order.

(*b*) The 4″ × 3″ double acting Horizontal Lee Howel Pump driven by a 5 B.H.P. motor functioned satisfactorily.

(*c*) The Walker & Greig pump driven by a 2 B.H.P. motor worked satisfactorily.

(*d*) One Mono Pump D 4 pumping set complete with 1½ H.P. direct coupled 3 phase motor at Nivitigalakele functioned satisfactorily.

(*e*) One 4″ × 5″ double acting horizontal Myres pump driven by a 5 B.H.P. motor installed at Hedigalla was maintained in good order.

Machinery and Laboratories.—All electrical machinery in the Laboratories were tested by the Visiting Engineer and defects were attended to by the Institute's Electrician.

NEW BUILDINGS ETC.—CAPITAL ACCOUNT

(*a*) Assistant Superintendent's Bungalow at Hedigalla.
Two Assistant Staff Grade I Bungalows at Dartonfield.
Extension to Plant Pathology Laboratory.
One Single Cottage at Nivitigalakele.

Contracts for the constructional work of above were awarded in September, 1957 and completed during the year under review.

(*b*) General Store at Dartonfield.
Alteration to Front Verandah of Director's Bungalow.
One Double Cottage for Assistant Engine Drivers at Dartonfield.
One Engine Room at Nivitigalakele.
One Garage for Apothecary.
Open Garage for 3 vehicles.
Extension to Tools Room.
One Creche at Dartonfield.

The works on above were completed in accordance with contracts awarded during the year.

(*c*) Five Intermediate Staff Bungalows (four at Dartonfield and one at Nivitigalakele).
One Assistant Staff Grade I Bungalow.

Contracts for above were awarded during the latter part of the year. Four Intermediate Staff Bungalows (one at Nivitigalakele) and the Assistant Staff Bungalow are under construction.

Water and Power Supply.—(*a*) The direct current power supply at Nivitigalakele was found to be inadequate and in keeping with the Rubber Research Board's policy of gradual transition from D.C. to A.C., the first step was taken to install an A.C. supply. Twin engines of 12 H.P. 2 YB. Ruston Hornsby Vertical cold start engines, direct coupled to 10 KVA. 400/230 Volts A.C. 3 phase 4 wire alternators, were housed in a new engine room by Messrs. Brown & Co., Ltd., in June, 1958.

(*b*) The following new electrical installations were carried out by the Institute's Electrician:—

Dartonfield.—(1) *Soils Department:* An auxiliary A.C. Converter and Expellair fan.

(2) *Plant Pathology Department:* Fluorescent light, Expellair fan, a thermo-control air conditioning unit and a Therma water heater.

(3) *Chemistry Department:* An A.C. converter as an auxiliary supply to the new A.C. Mooney machine.

(4) *Director's Office and Board Room:* Air conditioning and fluorescent lights.

Power service connections were given to the General Store room and two Assistant Staff Bungalows.

Hedigalla.—A power service line to the Assistant Superintendent's Bungalow.

RUBBER REPLANTING SUBSIDY SCHEME NURSERY AT HEDIGALLA

Superintendence.—The Estate Superintendent, R.R.I.C., paid supervisory visits to this nursery.

Staff.—Mr. D. D. Liyanearatchy was appointed Nursery Manager with effect from 6-1-58.

Mr. L. Samaranayake was appointed Assistant Nursery Manager with effect from 1-4-58.

Mr. D. C. Thambawita assumed duties as Assistant Clerk with effect from 1-9-58 when Mr. A. K. D. Amaradasa left to take up appointment in the Head Office of the Institute.

Rainfall.—201.77″ as against 181.15″ the previous year.

Seedling Nursery.—This nursery consists of two sections.

(*a*) Approximately 20 acres of nursery beds lined along the avenues (in between two rows of plants spaced 30 feet apart) leaving a distance of seven feet on either side of the plants.

(*b*) Fifty seven acres of nursery beds on cleared jungle land.

Budwood Nursery.—The 3,100 planting points made up of 200 plants of clone LCB 1320 and 2,900 plants of clone PB 86 reached sufficient maturity in the course of the year. Budwood from this nursery, augmented by supplies from outside sources, was utilised to meet the requirements of budded stumps for issues by the Rubber Control Department.

The Seedling and Budwood Nurseries were maintained in good condition throughout the year. Routine weeding, manuring and attention to paths and steps were carried out.

Planting Material.—68,239 budded stumps of clone PB 86 and 153,866 Tjir 1 clonal seedlings were issued from this nursery by the Rubber Control Department during the year under review.

GENERAL:

Correspondence:

Inward	...	...	609
Outward	...	...	1,315

Estimates.—(*a*) Estimates for 1959 Capital and Revenue Expenditure in respect of Dartonfield Group were prepared and submitted by the writer to the Rubber Research Board and were approved.

(*b*) Estimates for 1959 Capital and Revenue Expenditure in respect of the Rubber Replanting Subsidy Scheme Nurseries at Hedigalla were prepared and submitted by the writer to the Rubber Replanting Advisory Board and received approval.

REPORT OF THE CHAIRMAN, RUBBER RESEARCH BOARD

Board Membership.—The following changes in the membership of the Board occurred during the year:—

Mr. S. Pathmanathan was renominated by the Low Country Products Association of Ceylon for a further period of 3 years with effect from 21st January.

The three-year period of membership of Mr. Errol A. Jayawickrema terminated on 21st January and Mr. L. C. de Mel was nominated in his place by the Low Country Products Association.

Mr. W. P. H. Dias was renominated by the Hon'ble Minister of Agriculture and Food to represent the smallholders for a further period of 3 years with effect from 1st February.

Mr. G. H. Dulling was renominated by the Planters' Association of Ceylon for a further period of three years with effect from 15th February.

Mr. G. H. Carter resumed membership on return from leave with effect from 21st February relieving Mr. H. Cole-Bowen who had acted for him.

Dr. E. D. C. Baptiste, Director, resumed membership on return from leave with effect from 27th February relieving Mr. C. A. de Silva, Botanist, who had acted for him.

Dr. M. F. Chandraratne, Director of Agriculture, was away from the Island from 9th August and Mr. S. S. H. Silva, Deputy Director of Agriculture (Administration), acted for him until the return of Dr. Chandraratne on 25th October.

The three-year period of membership of Senator Thomas Amarasuriya, O.B.E., terminated on 6th November and Senator E. W. Kannangara, O.B.E., was nominated in his place by the Hon'ble Minister of Agriculture and Food.

The personnel of the Board at the end of the year was as follows:—

Ex-Officio Members:

The Director, R.R.I.C.—Dr. E. D. C. Baptiste, Ph.D. (Lond.), M.Sc., A.R.C.S., D.I.C., F.I.R.I.

The Director of Agriculture—Dr. M. F. Chandraratne, M.B.E., Ph.D., B.Sc. (Lond.), D.I.C., F.A.Sc.

The Deputy Secretary to the Treasury—Mr. H. E. Peries, O.B.E., C.C.S.,

The Rubber Controller—Mr B. Mahadeva, M.A., C.C.S.

Nominated Members:

Representing the Senate—Senator E. W. Kannangara, O.B.E.

Representing the House of Representatives—Mr. V. T. G. Karunaratne, M.P.

Representing the Smallholders—Mr. W. P. H. Dias, J.P.

Representing the Planters' Association of Ceylon—Mr. G. H. Carter and Mr. G. H. Dulling.

Representing the Low-Country Products Association—Mr. L. C. de Mel and Mr. S. Pathmanathan (Chairman).

Mr. C. D. de Fonseka functioned as Secretary to the Board during the year.

Meetings of the Board were held on 7th February, 28th March, 11th June, 29th August, 30th October and 17th December.

Committees:

Administrative Committee.—The following changes occurred in membership of the Committee during the year:—

Messrs. L. C. de Mel and V. T. G. Karunaratne were nominated to serve on the Committee.

Mr. S. S. H. Silva, Deputy Director of Agriculture (Administration), served on the Committee during the absence of Dr. M. F. Chandraratne, Director of Agriculture.

Mr. G. H. Carter resumed membership of the Committee on return from leave with effect from 21st February relieving Mr. H. Cole-Bowen who had acted for him.

Mr. C. A. de Silva served on the Committee during the absence of Dr. E. D. C. Baptiste, Director.

The personnel of the Committee at the end of the year was as follows:—

Mr. S. Pathmanathan (Chairman)
Mr. W. P. H. Dias
Mr. G. H. Carter
Mr. G. H. Dulling
Dr. M. F. Chandraratne
Mr. B. Mahadeva
Mr. L. C. de Mel
Mr. V. T. G. Karunaratne
Dr. E. D. C. Baptiste

Meetings of the Committee were held on 20th January, 14th March, 16th May, 12th August, 30th September, 9th October and 4th December.

Smallholdings Committee.—The personnel of the Committee at the end of the year was as follows:—

Mr. S. Pathmanathan (Chairman)
Mr. W. P. H. Dias
Dr. E. D. C. Baptiste

A meeting of this Committee was held on 25th July.

Smallholdings Department Selection Committee.—The personnel of the Committee at the end of the year was as follows:—

Mr. W. P. H. Dias
Mr. B. Mahadeva
Dr. E. D. C. Baptiste
Mr. R. T. Wijewantha (S.H.A.O.)

Meetings of this Committee were held on 16th April, 19th June, 25th July, 11th August and 22nd August.

Salaries Committee.—The personnel of the Committee at the end of the year was as follows:—

Mr. S. Pathmanathan (Chairman)
Mr. V. T. G. Karunaratne
Mr. B. Mahadeva
Mr. H. E. Peries

Meetings of this Committee were held on 20th January, 16th May and 12th November.

Ad hoc Committees:

Committee appointed to consider the terms of re-engagement of the Chemist.—A Committee consisting of Mr. G. H. Carter, Mr. B. Mahadeva, Dr. M. F. Chandraratne, Mr. H. E. Peries, the Chairman and the Director was appointed to consider the terms of re-engagement of Dr. E. J. Risdon, Chemist. A meeting of this Committee was held on 26th March.

Committee appointed for the Selection of a Rubber Chemist.—A Committee consisting of the Chairman, the Director, Dr. M. F. Chandraratne, Mr. B. Mahadeva and Dr. E. L. Fonseka, Professor of Chemistry, University of Ceylon, was appointed to interview a candidate for the post of Rubber Chemist. A meeting of this Committee was held on 25th June.

Committee appointed to discuss the Director's proposals for the appointment of a Works Inspector.—A Committee consisting of the Chairman, Mr. G. H. Dulling, Mr. L. C. de Mel and Mr. V. T. G. Karunaratne was appointed to discuss the Director's proposals for the appointment of a Works Inspector. Meetings of this Committee were held on 25th April and 27th August.

Committee appointed for the selection of an Assistant Estate Superintendent.—A Committee consisting of the Director, Botanist, Estate Superintendent, Visiting Agent and Mr. L. C. de Mel was appointed to select a candidate for the post of Assistant Superintendent. A meeting of this Committee was held on 22nd March.

Committee appointed to consider the purchase of a Sub-station.—A Committee consisting of the Chairman, Mr. B. Mahadeva, Mr. W. P. H. Dias, Mr. V. T. G. Karunaratne, Mr. G. H. Dulling, Senator Thomas Amarasuriya and the Director was appointed to consider the purchase of a Sub-station in the Sabaragamuwa area. Meetings of this Committee were held on 29th May and 12th August.

Provident Fund Committee.—A Committee consisting of Messrs. G. H. Carter, H. E. Peries, the Director and one member of the staff was appointed to

consider the advisability of investing the Provident Fund separately and make a recommendation to the Board. A meeting of this Committee was held on 3rd October.

Building Committee.—A Committee consisting of Messrs. L. C. de Mel, W. P. H. Dias, V. T. G. Karunaratne, the Chairman and the Director was appointed to consider tenders and other matters connected with the construction of buildings. A meeting of this Committee was held on 9th October.

Liaison with other Organizations:

London Advisory Committee for Rubber Research (Ceylon and Malaya).—The Board contributed jointly with the Rubber Research Institute of Malaya to the London Advisory Committee for the maintenance of the advisory services rendered by its Agricultural Sub-Committee.

FINANCE:

Income.—The Board's main income was derived from the cess on exports of rubber under Section 6 (1)*a* of the Rubber Research Ordinance (Cap. 302). As a result of representations made by the Board to the Hon'ble Minister of Agriculture and Food the rate of cess was increased from 55 cts. per 100 lbs. to 82½ cts. per 100 lbs. with effect from 1st January, 1958. Income from this source was more than the estimate for the year by Rs. 21,584/-.

Monthly cess collections were as follows:—

			Brought Forward	Rs.	735,716
January	Rs.	149,164	July	,,	164,700
February	,,	163,304	August	,,	117,676
March	,,	184,789	September	,,	125,311
April	,,	123,405	October	,,	245,427
May	,,	45,848	November	,,	191,066
June	,,	69,206	December	,,	104,888
Carried Forward	Rs.	735,716	Total	Rs.	1,684,784

A profit of Rs. 27,618/- was derived from the normal working of Dartonfield Group, and a grant of Rs. 281,500/- was received from Government for Small-holdings work.

Expenditure.—Recurrent expenditure amounted to Rs. 1,463,476/-.

Capital expenditure amounting to Rs. 607,481/- was incurred during the year the main items being:

Agricultural Development ...	Rs.	192,870
Buildings	,,	126,918
Laboratory Apparatus ...	,,	84,594

Accounts.—The accounts for the year with a Balance Sheet showing the property and liabilities of the Board will be prepared and submitted to the Auditor-General for examination.

Sgd. S. PATHMANATHAN,
Chairman of the Board,
Rubber Research Institute of Ceylon.

AUDITOR-GENERAL'S REPORT FOR 1957

No. P-2 (4) 8

AUDIT OFFICE,
Colombo 7, 30th October, 1958.

THE CHAIRMAN,
Rubber Research Board,
Agalawatta.

Dear Sir,

Accounts of the Rubber Research Institute for the year ended 31st December, 1957.

I return herewith the Balance Sheet as at 31st December, 1957, and connected financial statements duly certified together with my report thereon.

Yours faithfully,

Sgd. D. S. DE SILVA,
for Auditor-General.

My No. P-2 (3)—8

Report of the Auditor-General on the Accounts of the Rubber Research Institute for the year ended 31st December, 1957.

The accounts of the Rubber Research Institute for the year ended 31st December, 1957, were audited under my direction in pursuance of Section 8 (2) of the Rubber Research Ordinance.

The financial statements—*viz.:*

(*a*) Revenue Account for the year ended 31st December, 1957, and the Balance Sheet as at 31st December, 1957;

(*b*) Dartonfield Group Working Account for the year ended 31st December, 1957;

(*c*) Provident Fund Working Account for the year ended 31st December, 1957; and

(*d*) Assistant Staff Medical Fund Working Account for the year ended 31st December, 1957—

which were rendered for audit on 29th March, 1958, had to be returned for amendment and the amended statements were received in audit in September, 1958. The following are the comments which I wish to offer on these accounts:—

REVENUE ACCOUNT

2. **Income.**—The actual income for the year amounted to Rs. 1,518,584.44 which exceeded the estimated income of Rs. 1,455,144.00 by Rs. 63,440.44 and was more than the actual income for the previous year by Rs. 51,529.85. The increase over last year's was mainly due to the increase in cess collections by Rs. 85,802.55 despite a decrease of Rs. 51,105.35 in the profit from Dartonfield Group.

A comparative statement showing the estimated and actual income is annexed marked 'A'. The reasons of the Board for the variations are indicated in that statement.

(*b*) **Cess Collection Rs. 1,141,745.92.**—The cess collection for the year was Rs. 1,141,745.92 and exceeded the estimate of Rs. 1,108,800/- by Rs. 32,945.92. It also exceeded the collection during the previous year of Rs. 1,055,943.37 by Rs. 85,802.55. The increase was due to the larger quantity of rubber exported during the year.

(*c*) **Government Grant for Smallholdings Work Rs. 234,863.81.**—According to the estimates of 1956/57 of the Government, Rs. 226,500/- was provided under Head 82—Department of Agriculture, Vote 1—Sub-Head 15—item 'Grant to Rubber Research Institute for Rubber Planting Scheme'. The full provision of Rs. 226,500/- was paid to the Rubber Research Board by the Director of Agriculture, but according to the method of accounting adopted by the Board the amount included in these accounts is Rs. 222,363.81 as shown below:

(*a*)	Rs. 211,500.00	...	Grant by Department of Agriculture
(*b*)	Rs. 10,863.81	...	Unspent balance of the Grant of Rs. 15,000/- given by the Director of Agriculture for soil conservation work.
	Rs. 222,363.81		

The balance Rs. 4,136.19 (*i.e.* Rs. 226,500.00—222,363.81) represents the amount spent during the year by the Board out of the Rs. 15,000/- granted for soil conservation work. It has to be noted that neither the receipt of the Rs. 15,000/- referred to above nor the expenditure of Rs. 4,136.19 therefrom on soil conservation work are shown in these accounts. On inquiry it was explained that:

> 'As the estimate for 1957 had been prepared on the old basis neither the receipt of this Rs. 15,000/- nor the expenditure on soil conservation work have been shown in the Revenue Account; these are reflected in the ledger as an imprest account and the balance has been transferred to the Revenue Account'.

An additional grant of Rs. 12,500/- also became due for the year 1957 being the proportion for 3 months October to December, 1957, of increase of grant by Rs. 50,000/- effective from 1st October, 1957. This Rs. 12,500/- forms part of the provision of Rs. 276,500/- made in 1957/58 Estimates of Government under Head 82—Department of Agriculture, Vote 1, Sub-Head 12. When this Rs. 12,500/- is also taken into account the total amount shown in the Revenue Account under the description 'Government Grant for Smallholdings Work is Rs. 234,863.81.

As regards the sum of Rs. 3,746.65 representing the unspent balance in 1955-56 of the grant received for soil conservation work, which was paid back to the Director of Agriculture and referred to in para 2 (*b*) of my report on the accounts for the year 1956, the Treasury has now agreed to refund the amount to the Board.

3. **Expenditure—Rs. 1,369,459.78.**—The total expenditure amounted to Rs. 1,369,459.78 as compared with Rs. 1,391,685.29 for the previous year. The estimated and the actual expenditure and the reasons for variations are shown in the statement 'B'. The expenditure in respect of several items exceeded the sanctioned estimate by a total sum of Rs. 69,533.15 as indicated in the statement.

It is suggested that the Board's covering approval be obtained for all excesses.

4. **Contributions to Senior Staff Medical Scheme—Rs. 2,457.44.**—Rs. 300/- paid as *ex-gratia* payment to one of the Assistant Advisory Officers to take his wife to South India for special treatment was charged to the Senior Staff Medical Fund although there was no provision in the Medical Aid rules to meet such payments.

The Board on 10-7-1957 decided that it was incorrect to show it as an *ex-gratia* payment without the Minister's sanction and that the payment should be met from the Travelling Vote. The payment however remains charged to the Senior Staff Medical Scheme.

5. **Dartonfield Group Working Account.**—The working account of Dartonfield Group showed a profit of Rs. 29,011.13 which is less than the previous year's profit of Rs. 80,116.48 by Rs. 51,105.35. The decrease in profit in 1957 compared with the previous year was attributable mainly to a drop of -/14 cts. per lb. in the average selling price of rubber from Rs. 1.14 per lb. in 1956 to Re. 1/- per lb. in 1957. Although the yield for the year was 229,439 lbs. as compared with 205,866 lbs. in 1956, the income from this source fell short of last year's income by Rs. 17,338.84 as a result of the drop in average selling price in 1957. The expenditure of Rs. 202,483.38 during the year as compared with Rs. 167,892.04 of the previous year was more by Rs. 34,591.34.

BALANCE SHEET

6. **Idle Machinery—Rs. 1,606.33.**—Included in the value of 'Machinery and Tools' of Dartonfield Group is the cost of an electric generating set which was lying idle. This is a second hand generating set purchased from Messrs. Leslie Dixon & Co., London, in 1956, at a cost of Rs. 1,606.33 and installed in 1957. According to the Consulting Engineer's report this plant now requires a complete overhaul to put it in working order.

(ii) **Register of Fixed Assets.**—A register of fixed assets has not been maintained though this was suggested in para 5 of my report on the accounts for 1956.

7. **Investments at nominal value—Rs. 2,863,200.00.**—During the year under review 3¼% State Mortgage Bank Debentures of the nominal value of Rs. 148,150.00 were compulsorily redeemed and Rs. 168,200.00 was invested at par on the following securities:—

Rs. 119,500/- in Ceylon Government 3% Sri Lanka Loan—1969/74.

Rs. 48,700/- in Ceylon Government 3¼% Loan—1973/77.

8. **Library—Books and Periodicals.**—At present the books and periodicals in stock are not shown in the Balance Sheet as the practice is to charge their cost of purchase in full to the Revenue Account. It is suggested that while continuing to charge the cost of new books to the Revenue Account the asset may be included in the Balance Sheet at a nominal figure, say Rs. 10/-.

9. **Stock—Rs. 37,333.98.**—552 sq. ft. of timber that was in stock at the end of December, 1956, was not taken into account in 1957 although I suggested that this should be taken into account—(*vide* para 9 of the Audit Report for 1956).

(ii) There were 23 zinc sheets in stock as at 31-12-1957. This has not been shown in the accounts for 1957.

10. **Board of Survey Report.**—Board of Survey Report for the year 1957 was not received for examination in audit up to the date of this report.

Sgd. D. S. DE SILVA,
for Auditor-General.

Audit Office,
Colombo 7, 30th October, 1958.

RUBBER RESEARCH INSTITUTE OF CEYLON. A

ESTIMATE AND ACTUAL INCOME STATEMENT FOR 1957

	Estimate	Actual Income	Excess	Deficit	Remarks
	Rs. cts.	Rs. cts.	Rs. cts.	Rs. cts.	
Cess Collections	1,108,800.00	1,141,745.92	32,945.92	—	More exports than anticipated.
Government Grant for Smallholdings Work ...	231,500.00	234,863.81	3,363.81	—	Balance of Soil Conservation Grant not refunded to D.A.
Payment by the Rubber Controller from Rubber Subsidy Scheme Fund	20,000.00	20,000.00	—	—	—
Interest	80,665.00	88,494.46	7,829.46	—	Under Estimate.
Sale of Publications	4,000.00	3,098.06	—	901.94	—
Dartonfield Group Working	27,179.00	29,011.13	1,832.13	—	—
Sundry Receipts	3,000.00	1,371.06	—	1,628.94	Over Estimate.

RUBBER RESEARCH INSTITUTE OF CEYLON. B

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—1957

Head of Estimate	Account	Estimate	Expenditure	Excess	Savings	Remarks
		Rs. cts.	Rs. cts.	Rs. cts.	Rs. cts.	
1.	**ADMINISTRATION OF THE BOARD:**					
	A. Travelling Expenses of Board Members ...	5,000.00	2,275.06		2,724.94	Overestimate.
	B. Entertainment of Board Members ...	250.00	241.76		8.24	
2.	**EMOLUMENTS OF SENIOR SCIENTIFIC STAFF**	174,940.00	180,249.95	5,309.95		Increased salary of Director *Less* Rs. 5,000/- provided for Prof. Hardy but not paid.
3.	**EMOLUMENTS OF JUNIOR SCIENTIFIC STAFF**	64,031.00	64,565.25	534.25		Re-grading of Technical Assts.
4.	**LIBRARY AND PUBLICATIONS:**					
	A. Library	8,000.00	9,134.71	1,134.71		Under Estimate.
	B. Publications	10,000.00	6,239.26		3,760.74	*Less* publications.
5.	**SMALLHOLDINGS WORK:**					
	A—G & I Emoluments of Staff	264,951.00	263,647.74		1,303.26	Changes in Staff.
	H. J. & K. Travelling & General Expenses ...	105,870.00	72,396.35		33,473.65	Economies.
6.	**LABORATORY:**					
	A. Equipment and Working Expenses ...	54,800.00	53,877.86		922.14	do.
	B. Furniture Replacements	600.00	173.15		426.85	do.
7.	**FIELD & FACTORY EXPERIMENTS:**					
	A. Field Experiments	47,220.00	68,322.62	21,102.62		More Field experimental work than anticipated carried out by Botany/Pathology/Agro. Depts.
	B. Factory Experiments	45,610.00	35,183.97		10,426.03	Economies effected on labour and operation of power unit.
			c/o	28,081.53		

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—1957—(*Contd.*)

Head of Estimate	Account	Estimate	Expenditure	Excesses	Savings	Remarks
		Rs. cts.	Rs. cts.	Rs. cts.	Rs. cts.	
			b/f	28,081.53		
8.	**OFFICE:**					
	A—D. Emoluments of Office Staff ...	53,018.00	51,190.85		1,827.15	Changes in Staff.
	E. Stationery and Office Equipment ...	7,500.00	6,636.71		863.29	Economies.
	F. Postages and Telegrams	4,500.00	3,524.62		975.38	do.
	G. Advertising	2,500.00	2,756.02	256.02		More posts advertised.
	H. Telephone	1,700.00	1,509.80		190.20	Economies.
	I. Audit	4,700.00	4,700.00			
9.	**TRAVELLING EXPENSES OF STAFF** ...	24,000.00	53,028.25	29,028.25		Increased travelling of Director and Senior Scientific Staff.
10.	**MAINTENANCE CHARGES:**					
	A. General Buildings	3,826.00	3,722.37		103.63	Economies.
	B. Bungalows	11,978.00	14,852.08	2,874.08		More repairs than anticipated.
	C. Water and Power Supply	56,283.00	48,931.71		7,351.29	Savings on salaries of Clerk of Works & 2 Asst. Engine Drivers.
	D. Bungalow Furniture Replacements ...	1,500.00	1,708.42	208.42		More replacements than anticipated.
	E. Motor Vehicles	17,302.00	14,153.30		3,148.70	Additional credit received for use of Vehicles for Estate work.
11.	**MISCELLANEOUS ITEMS SHARED WITH ESTATES:**					
	A. Dartonfield Group General Charges ...	15,190.00	13,766.57		1,423.43	Economies.
	B. Upkeep of Building Premises	12,922.00	10,179.33		2,742.67	do.
	C. Factory Upkeep	7,710.00	4,530.51		3,179.49	do.
			c/o	60,448.30		

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—1957 (*Contd.*)

Head of Estimate	Account	Estimate	Expenditure	Excesses	Savings	Remarks
		Rs. cts.	Rs. cts.	Rs. cts.	Rs. cts.	
			b/f	60,448.30		
12.	**OTHER CHARGES:**					
	A. Contribution to L.A.C.	4,800.00	4,666.67	—	133.33	Difference in Exchange.
	B. Contingencies	1,500.00	2,455.55	955.55		Payment of Debit Tax.
	C. Insurance	16,050.00	10,931.34	—	5,118.66	Building Programme not completed.
	D. Staff Provident Fund	95,200.00	99,352.33	4,152.33		Additional bonus of 1 retiring and 2 deceased officers.
	E. Passages	15,000.00	15,000.00	—	—	—
	F. Entertainment Allowance	500.00	1,666.53	1,166.53	—	More Visitors.
	G. Dearness Allowance to Staff	122,070.00	118,506.07		3,563.93	Changes in Staff.
	H. Assistant Staff Medical Fund	8,000.00	4,984.16		3,015.84	Less Claims.
	I. Senior Staff Medical Scheme	3,000.00	2,457.44		542.56	do.
	J. Social Services	2,200.00	2,834.10	634.10		Additional Grant to Club and repairs to Dispensary refrigerator.
	K. Agri. Horticultural Show at N'Eliya ...	1,225.00*	1,299.24	74.24	—	
13.	**DEPRECIATIONS**	120,000.00	111,540.13	—	8,459.87	Building Programme not completed.
14.	**RENOVATION & REPLACEMENTS:** ...	5,250.00	2,268.00	—	2,982.00	Replacement of Water supply line of Asst. Staff Bungalows postponed.
15.	**ESTABLISHMENT & UPKEEP OF NURSERIES**	34,838.00	35,775.39	937.39		Under Estimate.
				68,368.44		

*Supplementary Vote.

RUBBER RESEARCH INSTITUTE OF CEYLON

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—1957 (*Contd.*)

Head of Estimate	Account	Supplementary Vote Rs. cts.	Initial Vote Rs. cts.	Estimate Rs. cts.	Capital Rs. cts.	Excess Rs. cts.	Savings Rs. cts.	Remarks
16.	**CAPITAL ACCOUNT:**							
	A. Upkeep of Immature Areas		195,342.00	195,342.00	188,127.28		7,214.72	Economies.
	B. Two Asst. Staff Bungalows, Dartonfield ...		34,000.00	34,000.00			34,000.00	Under Construction.
	C. Two Cottages for 2 new Asst. Engine Drivers ...		7,350.00	7,350.00			7,350.00	do.
	D. Additional Bath Room and Latrine for A.S. Chummery ...		900.00	900.00			900.00	Work not completed.
	E. Two Single Water Seal latrines for A.S.BB. ...		350.00	350.00	349.40		0.60	—
	F. 1 Drying Shed for Botanical Department ...		2,500.00	2,500.00	2,447.15		52.85	—
	G. Extension to Plant Pathology Laboratory ...		18,500.00	18,500.00			18,500.00	Under Construction.
	H. Green House ...		145,000.00	145,000.00	3,292.52		141,707.48	do.
	I. General Store ...	3,700.00	11,000.00	14,700.00			14,700.00	do.
	J. Structural alterations to I.S. Chummery ...		200.00	200.00	185.00		15.00	—
	K. 1 Cottage for K.P. at Nivitigalakele ...		3,675.00	3,675.00			3,675.00	Under Construction.
	L. 1 Temporary Smoke House at Hedigalla ...		1,500.00	1,500.00			1,500.00	do.
	M. Water & Power Supply ...	42,955.00	5,275.00	48,230.00	23,186.06		25,043.94	Work not completed.
	N. Roads at Dartonfield Group	13,483.00	4,950.00	18,433.00	4,444.08		13,988.92	do.
	O. Equipment for Agronomist	169.00	10,000.00	10,169.00	5,918.20		4,250.80	Payments not completed.
	P. ,, ,, Botanist ...	515.00	1,300.00	1,815.00	1,445.15		369.85	do.
	Q. ,, ,, Chemist ...	2,469.00	15,000.00	17,469.00	12,734.65		4,724.35	do.
	R. ,, ,, P/Pathology Dept. ...		32,500.00	32,500.00	30,395.05		2,104.95	do.
	S. Furniture and Fixed Equipment ...	2,350.00	13,225.00	15,575.00	15,858.18	283.18		
	T. Proportionate cost of Hedigalla Road ...		11,700.00	11,700.00	8,015.41		3,684.59	Work not completed.
	U. Asst. Supdt's. Bungalow at Hedigalla ...	49,855.00		49,855.00	2,562.92		47,292.08	Under Construction.
	V. Six Double Cottages at Hedigalla ...	28,218.00		28,218.00	26,419.47		1,798.53	Work not completed.
	W. Alterations to Board Room and Director's Room ...	1,000.00		1,000.00	953.98		46.02	—
	X. Bathroom Fittings for S.S.B. at Nivitigalakele ...	2,250.00			2,104.50		145.50	Economies.
	Y. Clearing 10 Acres at Hedigalla	6,079.00			6,960.53	881.53		Actual acreage of this clearing is 18 acres resulting in more expenditure on planting, etc. Ref. V.A's. Report of 22-4-58.
						1,164.71		

ASSISTANT STAFF MEDICAL FUND

WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1957

DR. **CR.**

	Rs. cts.		Rs. cts.
To Refund of Medical Expenses	9,438.44	By Balance brought forward from 1956	36,660.81
,, Refund of balances to 8 retiring officers during 1957 ...	483.65	,, Officers' contributions for 1957	6,265.48
,, Loans to 3 officers during 1957	293.94	,, Board's contribution for 1957	6,266.23
,, Balance carried forward to 1958	39,336.83	,, Loan instalments recovered	360.34
	49,552.86		49,552.86

Dartonfield,
Agalawatta.
14th March, 1958.

Administrative Secretary,
Rubber Research Institute of Ceylon.

RUBBER RESEARCH INSTITUTE OF CEYLON.

SCHEDULE OF FIXED ASSETS

	At 31st December, 1956 Rs. cts.	Assets Sold in 1957 Rs. cts.	Additions in 1957 Rs. cts.	Total at 31st December, 1957 Rs. cts.
To **LAND INCLUDING DEVELOPMENT:**				
Dartonfield	386,298.87		22,370.71	408,669.58
Nivitigalakele	202,357.55		6,471.95	208,829.50
Hedigalla	1,103,486.55		178,704.64	1,282,191.19
„ **BUILDINGS AND LINES:**				
Dartonfield				
Estate	224,171.03		—	224,171.03
Headquarters	764,781.32		7,228.05	772,009.37
Nivitigalakele				
Estate	47,124.96		—	47,124.96
Headquarters	25,112.33		—	25,112.33
Hedigalla				
Estate	272,796.51		—	272,796.51
Headquarters	40,409.51		26,419.47	66,828.98
„ **FURNITURE AND FIXED EQUIPMENT:**				
Dartonfield	158,323.11	3,375.75	29,778.23	184,725.59
Nivitigalakele	5,733.70		2,104.50	7,838.20
Hedigalla	4,628.71		2,726.62	7,355.33
„ **POWER AND WATER SUPPLY:**				
Dartonfield	166,442.23		21,552.30	187,994.53
Nivitigalakele	7,880.48		275.39	8,155.87
Hedigalla	26,767.79		3,733.37	30,501.16
„ **MACHINERY AND TOOLS:**				
Dartonfield	595,234.84		498.75	595,733.59
Nivitigalakele	4,754.23		—	4,754.23
Hedigalla	19,427.68		—	19,427.68
„ **LABORATORY APPARATUS**	257,745.55		50,493.05	308,238.60
„ **MOTOR VEHICLES**	68,024.85	11,013.00	6,099.46	63,111.31
	4,381,501.80	14,388.75	358,456.49	4,725,569.54

RUBBER RESEARCH INSTITUTE OF CEYLON.

VALUATION OF INVESTMENTS AS AT 31st DECEMBER, 1957

	Nominal Value		Present Market Value
	Rs. cts.		Rs. cts.
Ceylon Government 3½% Loan 1957/62	25,000.00	@ 101 15/16	25,484.37
Ceylon Government 3½% National Loan 1964/69	70,000.00	@ 106 1/16	74,243.75
Ceylon Government 3% Sri Lanka Loan 1969/74	750,000.00	@ 99 7/8	749,062.50
Ceylon Government 3% Loan 1973/78	600,000.00	@ 96 1/4	577,500.00
Ceylon Government 3% Loan 1966/71	500,000.00	@ 100	500,000.00
Ceylon Government 3% Loan 1969/72	250,000.00	@ 100	250,000.00
Ceylon Government 3% Loan 1972/77	500,000.00	@ 96 3/8	481,875.00
Ceylon Government 3% Sri Lanka Loan 1969/74	119,500.00	@ 99 7/8	119,350.63
Ceylon Government 3¼% Loan 1973/77	48,700.00	@ 100	48,700.00
	2,863,200.00		2,826,216.25

RUBBER RESEARCH INSTITUTE OF CEYLON.

BALANCE SHEET AS AT 31st DECEMBER, 1957

	Rs. cts.	Rs. cts.	Rs. cts.
ACCUMULATED FUNDS:			
Expended on Fixed Assets			4,725,569.54
Unexpended Funds			
Balance as at 31st December, 1956	820,413.48		
Add: Excess of Income over Expenditure 1957 ...	149,124.66		
Add: Depreciation written off and value of assets sold	12,096.62		
	981,634.76		
Less: Amount Expended on Fixed Assets during 1957	358,456.49		
		623,178.27	
Add: Reserve for Stabilisation of Income		1,000,000.00	1,623,178.27
DEPRECIATION RESERVE			803,453.31
CURRENT LIABILITIES:			
Creditors			
Sundries		53,453.85	
Receipts in Advance ...		106,749.78	
Security Deposits		4,000.00	
Loan from Rubber Controller		25,000.00	
			189,203.63
Provisions			
Audit Fees		8,948.05	
Passages		21,893.98	
			30,842.03

	Rs. cts.	Rs. cts.
FIXED ASSETS:		
At Cost	4,381,501.80	
Additions during the year	358,456.49	
	4,739,958.29	
Less: Sales	14,388.75	
		4,725,569.54
INVESTMENTS AT NOMINAL VALUE:		
Ceylon Government Securities		2,863,200.00
(Approximate Market Value Rs. 2,826,216.25)		
CURRENT ASSETS:		
Debtors		
Cess Collections for November and December	161,425.84	
Accrued Interest	22,398.99	
Sundries	119,503.49	
		303,328.32
Payments in Advance		66,002.79
Loans:		
Transport	52,000.33	
Purchase of Cookers	2,985.66	
		54,985.99
Stocks:		
Rubber at prices since sold	20,646.75	
Other Stocks	16,687.23	
		37,333.98

BALANCE SHEET AS AT 31st DECEMBER, 1957.—(*contd.*)

	Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
Brought Forward			Brought Forward		
Staff Funds			**Advance Accounts:**		
Medical Fund	39,336.83		Estate Superintendent	4,022.57	
Provident Fund	806,105.99		Smallholdings Advisory Officer	1,875.23	
		845,442.82	Postmaster-General	200.00	
			London Advisory Committee	14,918.20	
			Nurseries Advance Account	49,378.19	
					70,394.19
			Cash Balances:		
			Ceylon Savings Bank	4,681.51	
			Savings Deposit Bank of Ceylon	10,071.65	
			Fixed Deposit Bank of Ceylon	4,000.00	
			In Current Account	78,048.89	
			In Hand	72.74	
					96,874.79
		8,217,689.60			8,217,689.60

Dartonfield,
Agalawatta.
14-3-1958.

Administrative Secretary,
Rubber Research Institute of Ceylon.

The accounts of the Rubber Research Institute for the year ended 31st December, 1957, have been audited under my direction. I am of opinion that the Balance Sheet above set forth and the connected Financial Statements have been drawn up in accordance with the Books and Records maintained by the Board, so as to present fairly the financial position of the Board as at 31st December, 1957, and the results of its operation for the year ended on that date.

Audit Office, Colombo 7.
30th October, 1958.

Sgd. D. S. DE SILVA,
for Auditor-General.

RUBBER RESEARCH INSTITUTE OF CEYLON.

REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1957.

DR.

	Rs. cts.	Rs. cts.
To **ADMINISTRATION OF THE BOARD:**		
Travelling Expenses of Board Members ...	2,275.06	
Entertainment of Board Members ...	241.76	
		2,516.82
,, **PERSONAL EMOLUMENTS:**		
Senior Scientific Staff	180,249.95	
Junior Scientific Staff	64,565.25	
Office Staff	51,190.85	
		296,006.05
,, **LIBRARY & PUBLICATIONS:**		
Library	9,134.71	
Publications	6,239.26	
		15,373.97
,, **SMALLHOLDINGS WORK:**		
Emoluments of Staff (S.H.)	263,647.74	
Travelling and General Expenses (S.H.) ...	72,396.35	
		336,044.09
,, **LABORATORY:**		
Equipment and Working Expenses ...	53,877.86	
Furniture Replacements	173.15	
		54,051.01
,, **FIELD & FACTORY EXPERIMENTS:**		
Field Experiments	68,322.62	
Factory Experiments	35,183.97	
		103,506.59
,, **OFFICE:**		
Stationery and Office Equipment ...	6,636.71	
Postages and Telegrams	3,524.62	
Advertising	2,756.02	
Telephone	1,509.80	
Audit Fees	4,700.00	
		19,127.15
,, **TRAVELLING:**		
Travelling Expenses of Staff		53,028.25
Carried Forward ...		879,653.93

CR.

	Rs. cts.
By Cess Collections	1,141,745.92
,, Government Grant for Smallholdings Work	234,863.81
,, Payment by the Rubber Controller from Rubber Subsidy Scheme Fund	20,000.00
,, Interest	88,494.46
,, Sale of Publications	3,098.06
,, Profit from Dartonfield Group	29,011.13
,, Sundry Receipts	1,371.06
Carried Forward ...	1,518,584.44

REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1957—(*contd.*)

DR.

	Rs. cts.	Rs. cts.
Brought Forward ...		879,653.93
To **MAINTENANCE OF BUILDINGS, POWER & WATER SUPPLY & MOTOR VEHICLES:**		
Maintenance of General Buildings ...	3,722.37	
,, ,, Bungalows	14,852.08	
,, ,, Water & Power Supply ...	48,931.71	
Bungalow Furniture Replacements ...	1,708.42	
Maintenance of Motor Vehicles ...	14,153.30	
		83,367.88
MISCELLANEOUS ITEMS SHARED WITH ESTATES:		
Dartonfield Group General Charges ...	13,766.57	
Upkeep of Building Premises	10,179.33	
Factory Upkeep	4,530.51	
		28,476.41
,, **OTHER CHARGES:**		
Contribution to L.A.C.	4,666.67	
Contingencies	2,455.55	
Insurance Charges	10,931.34	
Staff Provident Fund	99,352.33	
Passages	15,000.00	
Entertainment Allowance	1,666.53	
Dearness Allowance to Staff	118,506.07	
Contribution to Asst. Staff Medical Fund	4,984.16	
Contribution to Senior Staff Medical Scheme	2,457.44	
Social Services	2,834.10	
Depreciation	111,540.13	
Expenses on Agri. Horticultural Show at Nuwara Eliya	1,299.24	
Renovations and Replacements	2,268.00	
		377,961.56
Excess of Income over Expenditure carried to Balance Sheet		149,124.66
		1,518,584.44

CR.

	Rs. cts.
Brought Forward ...	1,518,584.44
	1,518,584.44

Dartonfield,
Agalawatta.
14-3-1958.

Administrative Secretary,
Rubber Research Institute of Ceylon.

RUBBER RESEARCH INSTITUTE OF CEYLON.

DARTONFIELD GROUP WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1957

DR. **CR.**

	Rs. cts.	Rs. cts.		Rs. cts.	Rs. cts.
To **EXPENDITURE:**			By **SALE OF PRODUCE:**		
General Charges	56,124.00		Gross proceeds of Manufactured rubber 226,355 lbs.	229,784.25	
Upkeep, Manufacture and Distribution ...	146,359.38		Value of rubber issued for experiments ...	2,911.33	
		202,483.38		232,695.58	
Balance being excess of Income over Expenditure transferred to Revenue A/c.		29,011.13	*Less :* Brokerage and Lot Money ...	2,451.65	
					230,243.93
			Sundry Receipts		1,250.58
		231,494.51			231,494.51

Dartonfield,
Agalawatta.
14th March, 1958.

Administrative Secretary,
Rubber Research Institute of Ceylon.

PROVIDENT FUND

WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1957

DR.

	Rs. cts.
To Payment to 12 retired officers	60,601.16
,, Part Payments to 2 officers	17,067.28
,, Balance carried forward to 1958	806,105.99
	883,774.43

CR.

		Rs. cts.
By Balance brought forward from 1956		705,141.83
,, Board's bonus for 1957		72,997.00
,, Interest on officers' contributions		14,525.11
,, Interest on Board's bonus		15,398.86
,, Special bonus to 1 retired officer ...	Rs. 3,114.24	
,, Special bonus due to 2 deceased officers	,, 334.80	
		3,449.04
,, Board's bonus of 3 retired and 2 deceased officers ...		1,050.37
,, Interest for 1957 of 6 retired and 2 deceased officers ...		267.59
,, Officers' contributions during 1957		70,944.63
		883,774.43

Dartonfield,
Agalawatta.
14th March, 1958.

Administrative Secretary,
Rubber Research Institute of Ceylon.

ESTIMATES FOR 1959,

(Adopted by the Board, 30th October, 1958)

Estimate of Income for 1959

1.	Cess Collections	Rs.	1,663,200
2.	Government Grant for Smallholdings Work	,,	328,500
3.	Interest	,,	80,750
4.	Sale of Publications	,,	4,000
5.	Profit from Dartonfield Group Working	,,	16,265
6.	Sundry Receipts	,,	3,000
		Rs.	2,095,715

Estimate of Expenditure for 1959

RECURRENT EXPENDITURE:—

1. **Administration of the Board:**

(*a*) Travelling Expenses of Board Members	Rs.	5,000	
(*b*) Entertainment of Board Members ...	,,	250	
		Rs.	5,250

2. **Personal Emoluments:**

(*a*) Senior Scientific Staff	Rs.	239,247	
(*b*) Junior Scientific Staff	,,	87,439	
(*c*) Experimental Staff, Dartonfield Group ...	,,	39,157	
		Rs.	365,843

3. **Library and Publications:**

(*a*) Library	Rs.	15,964	
(*b*) Publications	,,	10,000	
		Rs.	25,964

4. **Smallholdings Department:**

(*a*) Salaries and Allowances	Rs.	369,904	
(*b*) Travelling and General Expenses ...	,,	137,945	
(*c*) Sulphur Dusting Scheme 1959 ...	,,	66,000	
		Rs.	573,849

5. **Laboratory:**

(*a*) Equipment and Working Expenses ...	Rs.	63,700	
(*b*) Furniture Replacements	,,	600	
			Rs. 64,300

6. **Field and Factory Experiments:**

(*a*) Field Experiments	Rs.	69,145	
(*b*) Factory Experiments	,,	57,210	
			Rs. 126,355

7. **Office:**

(*a*) Salaries of Office Staff	Rs.	62,543	
(*b*) Stationery and Office Equipment ...	,,	9,000	
(*c*) Postages and Telegrams	,,	5,000	
(*d*) Advertising	,,	3,000	
(*e*) Telephone	,,	1,800	
(*f*) Audit	,,	4,500	
			Rs. 85,843

8. **Travelling Expenses of Staff:**

Officers' Expenses			Rs. 76,000

9. **Maintenance Charges:**

(*a*) General Buildings	Rs.	5,186	
(*b*) Bungalows	,,	13,020	
(*c*) Water and Power Supply ...	,,	62,758	
(*d*) Furniture	,,	5,900	
(*e*) Motor Vehicles	,,	25,170	
			Rs. 112,034

10. **Miscellaneous items shared with Estate:**

(*a*) Dartonfield Group General Charges ...	Rs.	24,527	
(*b*) Upkeep of Building Premises ...	,,	16,108	
(*c*) Factory Upkeep	,,	6,570	
(*d*) Dartonfield Normal Working ...	,,	18,840	
			Rs. 66,045

11. **Other Charges:**

(*a*) Contribution to London Advisory Committee	Rs.	6,100	
(*b*) Contingencies	,,	1,500	
(*c*) Insurance Charges	,,	17,200	
(*d*) Staff Provident Fund	,,	138,139	
(*e*) Passages	,,	15,000	
(*f*) Entertainment Allowance ...	,,	4,850	
(*g*) Dearness Allowance to Staff ...	,,	137,500	
(*h*) Assistant Staff Medical Fund ...	,,	10,769	
(*i*) Senior Staff Medical Scheme ...	,,	4,500	
(*j*) Social Services	,,	2,500	
			Rs. 338,058

12.	**Depreciation**	Rs.	147,800
13.	**Renovations and Replacements**	,,	22,505
14.	**Establishment and Upkeep of Nurseries**	,,	21,098
		Rs.	2,030,944
	Less: Item 13 to be met from Depreciation Reserve ...	,,	22,505
	Nett Revenue Expenditure to be met from General Funds	Rs.	2,008,439

CAPITAL EXPENDITURE:—

1.	Agricultural Development	Rs.	160,482
2.	Buildings	,,	92,175
3.	Equipment	,,	162,306
4.	Vehicles	,,	13,400
5.	Roads	,,	750
6.	Water and Power Supply	,,	3,760
7.	General	,,	6,000
		Rs.	438,873
	Less: Amount available from Depreciation Reserve ...	,,	8,750
	Nett Capital Expenditure to be met from General Funds ...	Rs.	430,123

SUMMARY

Income	Rs.	2,095,715	
Expenditure:			
Recurrent	Rs.	2,008,439	
Capital	,,	430,123	
	Rs.	2,438,562	
Excess of Expenditure over Income	Rs.	342,847	

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