Annual Report of the Rubber Research Institute of Ceylon.—1957.

The present report is the twenty-seventh 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

The Institute's advisory services, as measured by the volume of outgoing correspondence and the number of estate visits, showed a substantial increase during the year.

Advisory leaflets were issued by the departments of Plant Pathology, Agronomy, Chemistry and Smallholdings.

Highlights and important events of the year comprise the following:—

(*a*) The visit to the Institute of the Hon. the Minister of Agriculture and Food to acquaint himself with the work in progress, both in the field and in the laboratory.

(*b*) Government approval of a recommendation of the Industry for an increase of the rubber research cess from cents 55 to 82½ per 100 lb. of rubber exported from Ceylon.

The additional income required for the operation of the five year programme of development which was approved by the Rubber Research Board at the end of 1956 will thus be available with effect from the beginning of 1958.

(*c*) Government approval of the grant to the Institute of a long term interest-free loan of one million rupees for the establishment and development of three sub-stations of 200 acres each.

It is intended to have these sub-stations in the Kegalle, Kelani Valley/Ratnapura and Galle districts of the Island.

(*d*) Government approval of an additional grant of Rs. 50,000/- per annum for an extension of the Sulphur Dusting Scheme of the

Smallholdings Department of the Institute to cover all economic smallholdings in the Island.

A total area of 3,120 acres of smallholders' rubber sulphur dusted by the Smallholdings Department during the Oidium season of 1957 constituted a record for the largest acreage of smallholdings dusted in any one season.

(*e*) Government approval for the assignment by the United States Operations Mission to Ceylon, to this Institute for a period of two years, of a Plant Breeder with experience of Hevea breeding work in Latin America.

The Officer selected for this assignment is expected to arrive in Ceylon during the second half of 1958.

(*f*) The completion of an exchange of Hevea clones between this Institute and the United States Department of Agriculture.

For the twenty five RRIC clones given by the Institute, the United States Department of Agriculture gave in exchange fifty carefully selected Dothidella-resistant clones mostly of the first back cross with the Eastern parent (BC 1). Forty six of these clones have been successfully established in Ceylon.

(*g*) Agreement with the Director, Instituto Agronomico do Norte, Belem, Brazil for an exchange in the summer of 1958, of twenty five RRIC clones for the same number of Dothidella-resistant clones of the second back cross with the Eastern parent (BC 2) which are 7/8ths Eastern and only 1/8th Hevea benthamiana.

(*h*) Agreement in principle with the Director, Inter American Institute of Agricultural Sciences, Turrialba, Costa Rica, for the establishment there of a testing station for resistance to Dothidella and Phytophthora of clones bred in the Far East from crosses of Brazilian Dothidella-resistant clones with high yielding Eastern clones.

This matter of a testing station in Turrialba has now been taken up by F.A.O. Rome on behalf of all rubber growing countries and the necessary funds will be provided for the purpose.

(*i*) Acceptance by the Rubber Research Board of the principle that the Director and Heads of Technical Departments of the Institute should have more frequent personal contact with the staff of other Rubber Research Institutes by means of periodical visits.

(*j*) Decision of the Rubber Research Board to reduce the period of contract of overseas officers to 2 years followed by 4 months' leave at the option of the officers concerned.

During the year under review the following changes were made:—

(i) The title of the Annual Report from "Report of the Work of the Rubber Research Board" to "Annual Report of the Rubber Research Institute of Ceylon."

(ii) The clone designation RLD (Research Laboratories Dartonfield) to RRIC (Rubber Research Institute of Ceylon).

(iii) The designation "Smallholdings Propaganda Officer" to "Smallholdings Advisory Officer."

STAFF

Senior Staff:

The Director, Dr. E. D. C. Baptiste, was in charge of the work of the Institute until 13th September when he proceeded to U.K. on overseas leave. While on leave he paid a short visit to America, in connection with arrangements for exchange of clones. He was also away in Malaya during the period 11th to 27th April. In addition to his normal duties as Director, he acted for the Botanist when the latter went on end-of-contract leave from 20th January for a period of 4 months.

The Botanist, Mr. C. A. de Silva, returned from leave on 21st May, and was on duty for the remainder of the year. He acted for the Director from 13th September until the end of the year.

The Chemist, Dr. E. J. Risdon, was on 4 months end-of-contract leave from 27th March to end of July and the work of the Chemistry Department was carried on during this period under the supervision of the Director.

The Agronomist, Mr. D. H. Constable, was on duty till mid-December, when he retired from the service of the Institute.

The Plant Pathologist, Dr. A. Riggenbach, was on duty throughout the year and made a brief visit to South India in mid-November to inspect certain phytophthora experiments carried out there.

The Smallholdings Advisory Officer, Mr. R. T. Wijewantha, was on duty throughout the year. The designation Smallholdings Propaganda Officer was changed to Smallholdings Advisory Officer with effect from 28th March.

The Administrative Secretary, Mr. C. D. de Fonseka, was on duty throughout the year.

The Estate Superintendent, Mr. L. Wijeyegunawardena, was on duty throughout the year.

The Assistant Plant Pathologist, Mr. O. S. Peries, was on duty throughout the year.

The Research Assistant, Agronomy Department, Mr. A. J. Jeevaratnam, was promoted to the post of Assistant Agronomist with effect from 1st June, and was on duty throughout the year.

Intermediate Staff:

Mr. D. M. Fernando, Assistant Plant Breeder, was on duty throughout 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. L. B. Chandrasekera, Research Assistant, Botany Department, was absent throughout the year on study leave under a Colombo Plan Scholarship at the University of Cambridge.

Mr. N. W. Palihawadena, Senior Assistant Advisory Officer, Smallholdings Department, was on 3 months end-of-contract leave from 11th August to 12th November.

Mr. K. Wilson de Silva, Assistant Advisory Officer, Smallholdings Department, was on 3 months end-of-contract leave from 1st May to end of July.

Mr. H. H. Peiris, Assistant Advisory Officer, Smallholdings Department, was on 3 months end-of-contract leave from 1st February to end of April.

Assistant Staff:

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

One Office Assistant
Four Clerk-Typists
One Record Clerk
One Junior Clerk
One Clerk-Librarian (Vacant).
One Accounting Assistant
One Pay Clerk
Two Accounts Clerks
One Storekeeper.

One Personal Assistant to Director (new appointment).

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 (exclusive of the vacant post of Agronomist)
Senior Staff Grade II	...	2
Intermediate Staff	...	6
Assistant Staff	...	106
Minor Staff	...	38
Total	...	159

GENERAL

The Rubber Research Ordinance was amended twice during the year, by Amendment Acts No. 8 of 1957 and No. 52 of 1957.

The former provides as follows:—

> "In the exercise of its powers, the performance of its duties and the discharge of its functions, the Board shall be subject to, and act in accordance with, such general directions as the Minister may issue from time to time."

The latter makes the following provision:—

> "On and after January, 1958, an export duty of thirty-three-fortieth of a cent, on every pound of rubber exported from Ceylon."

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.

At the request of the Board the Director agreed to extend his first tour of service by one month so that he could be present when the departmental research programmes and estimates for 1958 were considered by the Administrative Committee. He proceeded on his overseas leave on 13th September.

MEETINGS

The Director attended the following meetings:—

Rubber Research Board	5	(Director on 22/2, 28/3, 28/5, 15/7 and 12/9).
—do—	1	(Acting Director on 18/11).
Administrative Committee, R.R.B.	4	(Director on 13/2, 15/5, 29/6 and 6/9).
Administrative Committee, R.R.B.	1	(Acting Director on 28/10).
Smallholdings Committee, R.R.B.	1	(Acting Director on 20/12).
Smallholdings Department's Selection Committee, R.R.B.	1	(Director on 13/2).
Ad hoc Committees, R.R.B.	2	(Director on 25/3 and 2/9).
—do—	1	(Acting Director on 14/11).
Rubber Replanting Advisory Board	23	(Director on 4/1, 18/1, 1/2, 6/2, 19/2, 5/3, 26/3, 2/4, 10/4, 30/4, 16/5, 29/5, 7/6, 18/6, 25/6, 2/7, 12/7, 22/7, 5/8, 13/8, 19/8, 30/8 and 10/9).
Rubber Replanting Advisory Board	11	(Acting Director on 17/9, 30/9, 11/10, 21/10, 5/11, 13/11, 28/11, 5/12, 12/12, 20/12 and 31/12).
Planters' Association of Ceylon	4	(On 12/2, 19/2, 29/3 and 18/6*).
District Planters' Associations:		
Kalutara	3	(On 27/2*, 17/5* and 23/8*).
Kegalle	1	(On 26/6*).
Sabaragamuwa	1	(On 16/8*).
Low Country Products' Association	2	(On 6/3 and 30/3).
Central Board of Agriculture	1	(Director on 22/5).
—do—	1	(Acting Director on 27/9).
Ceylon Chamber of Commerce	1	(On 27/3).
Ceylon Planters' Society	1	(On 18/5).
Rubber V.A. Conferences	3	(On 3/1 and 21/2).
Phytophthora Conferences at Dartonfield	1	(On 28/8).
T.R.I. Appointment Committee	1	(On 9/4).
Planning Council of Planning Secretariat	2	(Director on 19/3 and Acting Director on 13/11).
Committee appointed by Govt. to study question of Fragmentation of Estates	4	(On 29/1, 7/2, 18/2 and 6/3).

R.R.I.C. Senior Staff Committee	2	(On 1/6 and 10/8).
Agricultural Sub-Committee, L.A.C.	1	(On 30/10*).
Total	78	

*These meetings were addressed by the Director.

VISITS

The following visits were made by the Director:—

Estates: Udapolla (16/1); Eladuwa (9/2, 14/3, 16/3); Malaboda (16/3); St. George (16/3); Mirishena (18/3); Dalkeith (17/3) and Elpitiya Group (26/7).

Smallholdings: Kesbewa Range: 7 dusted holdings and 1 new planted area. Gampaha Range: 5 dusted holdings and 1 new planted area interplanted with pineapple.

Heneratgoda Botanical Gardens: Inspection of first rubber trees planted in Ceylon in 1876.

Ceylon Institute of Scientific and Industrial Research (by Acting Director): Exploratory talks on matters of interest regarding the development of R.R.I.C. Library.

A visit was also paid to Gal Oya Valley with other members of the Central Board of Agriculture during the period 22nd to 24th May to attend a meeting of the Central Board of Agriculture and to inspect the Development Scheme. Among the interesting places visited by the party were the Senanayake Samudra, Pallang Oya Detention Reservoir Construction Works, Ekgal Aru Detention Reservoir, Tile Factory, Sugar Plantation Project, Animal Breeding Centre, Agricultural Research Station, Base Workshops, Technical Training Institute, Industrial and Soil Chemist's Laboratory, Rice Mill and Left Bank Colonization Areas.

The Director visited rubber estates and smallholders' replantings in Malaya during the period 11th to 27th April at the request of the Rubber Research Board and the Rubber Replanting Advisory Board. Altogether fifteen estates and twenty-one smallholders' replantings were visited and also the R.R.I. of Malaya Experiment Station, the Chemara Research Station and the Dunlop Research Centre. Two reports on these visits were submitted to the respective Boards.

Towards the end of the year the Director, while on leave in U.K., took the opportunity to visit U.S.A. and certain Central and South American countries to select a number of Dothidella and Phytophthora-resistant clones and expedite their despatch from the U.S.D.A. Plant Introduction Station, Miami to Ceylon.

Places visited in the U.S.A. included the Research Centre of the United States Rubber Company at Wayne, New Jersey, the headquarters of the United States Department of Agriculture at Beltsville, the headquarters of

International Co-operation Administration at Washington, the B.F. Goodrich Research Centre at Brecksville, the headquarters of the Goodyear and the Firestone Rubber Plantations Companies at Akron.

Rubber Stations in Guatemala, Costa Rica, Peru and Brazil were also visited and interesting observations made on the breeding work in progress.

At Turrialba in Costa Rica the opportunity was taken to discuss with the Director of the Inter American Institute of Agricultural Sciences, Dr. Ralph H. Allee, the question of the establishment there of a testing station at which could be tested for resistance to Dothidella and tolerance to Phytophthora new material bred in the Far East from the crossing of Dothidella-resistant clones with high yielding Eastern clones. Dr. Allee offered his co-operation for the establishment of the testing station at Turrialba.

At Los Diamantes in Costa Rica and at Belterra in Brazil a thorough inspection was made of Dothidella-resistant clones for vigour and tolerance to Phytophthora. Notes were made of the disease resistance and secondary characters of second back crosses (BC 2) which are seven eighths Eastern and one eighth Benthamiana and agreement was reached with the Director of the Instituto Agronomico do Norte, Belem, Brazil, Dr. Rubens R. Lima, for an exchange of twenty five of these clones for the twenty five Ceylon clones which have already been given in exchange to the U.S. Department of Agriculture.

A visit was then paid to the U.S. Department of Agriculture Plant Introduction Station, Miami, Florida, to collect the disease-resistant South American clones selected in exchange for Ceylon clones.

Fifty of these Dothidella-resistant clones were introduced into Ceylon in December. These consist of 20 FX clones, some of which have good yields and tolerance to Phytophthora, and of 30 second generation IAN clones, mostly first back crosses or outcrosses with high yielding Eastern clones and therefore three quarters Eastern. Selection of these clones was done personally by the Director at Los Diamantes station in Costa Rica and at Belterra Estate in Brazil.

The budwood collected from Coconut Grove, Miami, on 14th December was, after disinfection and packing, flown from New York to London where it arrived on the morning of 17th December, a bitterly cold day with air temperature of 21°F (11 degrees of frost). It was hurriedly taken to the Commonwealth Mycological Institute, Ferry Lane, Kew, where it was again disinfected and repacked in new packing material and then taken back to London Airport where it was left in a heated room awaiting despatch to Ceylon.

On arrival in Ceylon the budwood was again disinfected by temporary immersion in mercuric chloride (0.2%) in 50 per cent methyl alcohol before it was budded, in continuous rain, on 23rd and 24th December.

The budding successes have been most encouraging, averaging 47 per cent and comprising 46 of the 50 clones imported.

Permission was granted by the Rubber Research Board for the Director to visit the 82,000 acre Harbel Estate of the Firestone Plantations Company in Liberia on his way back to Ceylon in February 1958 to negotiate an exchange of clones.

During his leave in England the Director attended a meeting of the Agricultural Sub-Committee of the London Advisory Committee for Rubber

Research (Ceylon and Malaya) at which was discussed the Annual Report of the R.R.I. of Ceylon for 1956, Progress Reports for the first half year 1957 and Programme of Work for 1958.

He also visited the School of Agriculture of the University of Cambridge, to discuss with some members of the teaching staff plans for the further training of Mr. L. B. Chandrasekera, Research Assistant, Botany Department, and a Colombo Scholar at Cambridge; the Department of Agriculture, the University of Oxford, to discuss with Professor G. E. Blackman recent progress in the development of weed killers; the Plant Protection Research Station at Fernhurst to discuss fungicides and stickers; the laboratories of the British Rubber Producers' Research Association and of the Rubber Technical Development at Welwyn Garden City and the Rothamsted Experimental Station, Harpenden.

The assistance received from the Secretary, London Advisory Committee for Rubber Research (Ceylon and Malaya), Mr. J. A. Nelson, and from the Director, Commonwealth Mycological Institute, Dr. J. C. Hopkins, is gratefully recorded.

EXHIBITIONS

The Institute took part in the Agri-Horticultural Show held at Nuwara Eliya on 17th and 18th April. Samples and photographs were submitted for the purpose by the Chemistry, Botany, Plant Pathology and Smallholdings Departments.

PUBLICATIONS

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

(1) For information of the Rubber Research Board:

- (*a*) Director's Report for 1956
- (*b*) Director's Report for 1st half-year 1957
- (*c*) "Report on Visit to R.R.I. of Malaya and Rubber Estates in Malaya"
- (*d*) Research Programmes for 1958

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

"Report on Visit to Smallholders' Replantings in Malaya"

(3) For information of the London Advisory Committee for Rubber Research (Ceylon and Malaya):

"Progress Report of the Director, R.R.I. of Ceylon, for the period 19th February, 1956, to 4th September, 1957"

(4) Contributions to 1956 Annual Reports of the Planters' Association of Ceylon and of the Low Country Products' Association, to the Administrative Report of the Department of Agriculture, to the Ceylon National Memorandum of the 13th meeting of the International Rubber Study Group and to the Ceylon Year Book 1957:

"Work of the Rubber Research Institute of Ceylon in 1956."

(5) Contribution to the *Times of Ceylon* Industrial and Agricultural Supplement:

"The Rubber Research Institute of Ceylon—Its Origin and Purpose."

(6) Contribution to "SCAN" of the Shell Co. of Ceylon Ltd.

"Breeding and Selection Work of the Rubber Research Institute of Ceylon."

(7) For information of the Sub-Committee appointed by the National Planning Council:
"Development Programme for Rubber" by Acting Director.

(8) For publications in R.R.I.C. Quarterly Circulars for 1957:

(*a*) "The Rubber Research Institute of Ceylon—Its Origin and Development."

(*b*) "Planting Out Rubber Seedlings from Germination Beds."

(*c*) "Pre-Treatment of Cover Crop Seed for Quick Germination."

The following roneoed Advisory Leaflets were issued:

No. C/57/1 —Fungicides *v.* Phytophthora Leaf Disease—Contamination of Rubber.
No. C/57/2 —Abstract from the Annual Report for 1956 of the Chemistry Department.
No. C/57/3 —Abstract from the Annual Report for 1956 of the Chemistry Department.
No. PP/57/1—Notes for the Phytophthora Season 1957.

The following publications were issued:—

(*a*) *Annual Report of the Rubber Research Institute of Ceylon for* 1956.

(*b*) *Combined 3rd and 4th Quarterly Circulars for* 1956.

(*c*) *Combined 1st and 2nd Quarterly Circulars for* 1957.

(*d*) *Advisory Circular No.* 59*A*—Magnesium Deficiencies.

(*e*) S.H. Folders: No. 4 —Sulphur Dusting Controls Oidium.
No. 4A—Sulphur Dusting of Smallholdings.

VISITORS

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

1st half of 1957:

The Minister of Agriculture and Food, the Hon. D. P. R. Gunawardena, M.P.

Sir Cecil Syers, K.C.M.G., C.V.O., High Commissioner for the U.K. in Ceylon.

Mr. H .E. Schwartz, Chief Agriculturist, United States Operations Mission to Ceylon.

Mr. D. W. Hawkins, General Manager, Dunlop Plantations Ltd., London.

Mr. G. Fellowes, Managing Director, Grand Central Rubber Co., Ltd., London.

Mr. Peter Wright, World Bank, Washington D. C.

Professor F. Hardy. C.B.E., M.A., Trinidad, B.W. Indies.

Mr. C. Thorogood, U.K. Trade Commissioner in Ceylon.

Mr. L. W. Mackie, Thomson Alston & Co., Ltd., London.

Mr. B. S. Gray, B.Sc., Prang Besar Rubber Co., Ltd., Malaya.

Mr. H. Keller, Chargé d'Affaires ad interim of Switzerland.

Herr Hans G. von Stieglitz, Commercial Attaché of Legation of the Federal Republic of Germany.

Mr. H. Cole-Bowen, Director, Carson Cumberbatch & Co., Ltd., Colombo.

Mr. J. P. Stewart, Director, Leechman & Co., Ltd., Colombo.

Mr. P. A. Rodrigo, Bureau of Plant Industry, Manila P.I.

Mr. C. Selwyn Samaraweera, Vice Chairman, L.C.P.A. of Ceylon.

2nd half of 1957:

Mr. C. G. Akhurst, Deputy Director, R.R.I. of Malaya.

Mr. T. L. Crosthwait, Deputy High Commissioner for the U.K. in Ceylon. Mr. Pennock, Acting U.K. Trade Commissioner in Ceylon and Mr. Stephen Rose of the Office of the High Commissioner for the U.K. in Ceylon.

Chinese Trade Delegation to Ceylon.

Dr. Ralph Liljelund of the Ceylon Institute of Scientific and Industrial Research.

Mr. D. A. Redmond, Librarian, Ceylon Institute of Scientific and Industrial Research.

Mr. John M. F. Greenwood, Assistant Smallholdings Advisory Officer, R.R.I. of Malaya.

Mr. B. H. Darley, Colombo Manager, Messrs. I.C.I. (Ex.) Ltd., Colombo.

Mr. G. G. Taylor, Plant Pathologist, Fruitgrowers Chemical Co., Ltd., Port Mapua, Nelson, New Zealand.

Mr. Francis J. Le Beau, Plant Pathologist, U.S. Operations Mission to Ceylon.

Mr. Luitz, Asst. Commercial Manager, Messrs. Shell Co., London.

Miss Evelyn M. Schwarztrauber, Second Secretary of American Embassy, Colombo.

Mr. F. Price, Visiting Agent of Malayalam Plantations Ltd., S. India.

Mr. J. A. Ward, B.Sc. (Ag.), Fertiliser Dept. Manager, Parry & Co., Ltd., Madras.

Trainers in Rural Organisations from seven countries in Asia and Africa.
Two members of Burmese Legation.

Mr. H. W. Moll, Director, Experiment Station, Kota Nica, Hollandia, Neth. New Guinea.

Dr. G. Watts Padwick, Plant Protection Ltd., London.

Mr. R. Prins, Internatio, Rotterdam.

The visit of the Hon. Minister of Agriculture and Food provided the opportunity to acquaint him with the progress of the research work in the field (Hedigalla and Dartonfield Stations) and in the laboratory. The Technical Departments were visited in turn and each Head of Department gave a brief review of the work of his Department, with the aid of charts and exhibits.

A discussion took place in the Board Room, at which were present the Chairman, Rubber Research Board, and three other members of the Board, when the Director outlined to the Hon. Minister his plans for expanding the work of the Institute.

CORRESPONDENCE

A considerable increase in the volume of correspondence has been recorded during the year.

Correspondence figures are as follows:—

		Inward	*Outward*
Director	General ...	985*	452*
	Technical ...	560+	640+
Administration Dept.	...	3,569	4,855
Botany Dept.	...	243	198
Plant Pathology Dept.	...	1,153	1,384
Agronomy Dept.	...	714=++	669=++
Chemistry Dept.	...	540	565
Smallholdings Dept.	General ...	5,252	9,046
	With Rubber Controller	796P	7,889£§
Estate Dept.	...	1,244	1,779
	Total in 1957 ...	15,056	27,477
	Total in 1956 ...	15,396	21,435
	Increase in 1957 (outgoing)		6,042

*Includes correspondence handled by Acting Director during permanent Director's overseas leave.

+Includes Botany Department correspondence handled by the permanent Director during Botanist's end of contract leave as well as correspondence handled by Acting Director on behalf of permanent Director during his overseas leave.

=++Includes Agronomy Dept. correspondence handled by Acting Director since resignation of the Agronomist.

PIncludes 500 packets applications and Final Inspection Reports.

£§Includes 5,676 preliminary reports and 1,933 Final reports.

NOTES ON DEPARTMENTAL REPORTS

Botany:

The report consists largely of yield records from field trials of local and foreign clones.

The pollination programme for 1957 consisted mostly of outcrosses with a number of backcrosses and some "selfs".

The fruit set of the selfs was only 0.2 per cent compared with an average of 4.0 per cent for outcrosses and back crosses.

The overall pollination successes amounted to 3.8 per cent or 1,114 fruit but, owing to losses through pod rot caused by Phytophthora, only 695 legitimate seedlings have been established in nurseries.

Forty six of the fifty Dothidella-resistant clones imported into Ceylon in December have been successfully established in our nurseries. They represent material especially selected for use in our breeding work.

Owing to the decision to test new material on replanted areas from 1957 onwards, and until the development of substations in 1958/59, the material selected for establishment in field trials this year has been put out in 300-tree-plots of each clone on two estates of the Kalutara district, the combined trials occupying a total area of 40 acres and comprising 21 clones with clone PB 86 as control clone.

Experiments with crown budding of twin seedlings seem to show a small positive effect of the yield of the crown on that of the centre section.

In a crown budding experiment on budded trees clone PB 86 used as a crown has improved the yield of most clones on which it is budded and no difference in yield of the centre section is found with heights of budding of 5 ft. and 8 ft. respectively.

Crown budding with clone LCB 870, at least when done on 2-year-old seedlings, has resulted in a reduction of girth of 4½ inches at the end of the third year from crown budding.

In a trial of eight Chemara clones the best growth and the best early yields have been obtained with clone Chemara 26 which up to now, contrary to Malayan experience, has not shown any undue susceptibility to wind breakage.

Plant Pathology:

There has been a substantial increase in the volume of correspondence and number of estate visits compared with the corresponding period of 1956.

The incidence of Oidium during the refoliation period was in general mild in most districts. It showed an increase with the wet weather experienced towards the end of wintering, especially in areas of late wintering clones, but could be effectively controlled by sulphur dusting.

The results of dusting trials with Karathane and Sulphur showed that the best results, as judged by leaf counting, is obtained with sulphur dust applied twice a week at the rate of 12 lbs. per acre per round and that treatment with Karathane dust (containing 1 per cent of the active material) applied at the rate of 24 lbs. per acre per round once a week occupies an intermediate position between the twice-weekly and the once-weekly treatments with sulphur dust applied at the rate of 12 lbs. per acre per round.

An experiment in plantings of clones Glenshiel 1 and PB 25 showed that leaf fall, brought about by Oidium and assessed by leaf counts, is more than

twice as high in blocks dusted with Sulphur at the reduced rate of 6 lbs. per acre per round than in blocks dusted at the normal rate of 12 lbs. of Sulphur dust per acre per round. Under conditions of refoliation during a prolonged wet period a low degree of control of Oidium would be expected with the reduced rate of sulphur dusting.

The incidence of leaf fall caused by Phytophthora was heavy in July, particularly in the wetter rubber growing districts.

Large scale field experiments for the control of the disease showed copper-based fungicides used as dusts, to be the most effective and economic means of control. No marked differences were observed between the different brands of commercial copper dusts containing 4 and 6 per cent copper without a sticker or between copper oxide or oxychloride at equivalent concentrations.

Ciba dust containing 1 per cent copper and a sticker was as effective as other copper dusts containing 4 per cent copper but no sticker.

The best control was obtained with a rate of application of 8-10 lbs. per acre per round and with dusting rounds spaced at about five-day intervals.

Organo-metallic fungicides, *e.g.* carbamates based on zinc, showed some promise and will be tested further.

Organic fungicides, based on thiuram and phthalic anhydride, were tested. The former was effective at a concentration of 4 per cent of the active material and the latter was quite ineffective at concentrations of up to 2 per cent of active material.

Indirect methods of Phytophthora control, by (*a*) destroying the pollinating insects and thus reducing the fruit set and (*b*) by destroying the flowers, were unsuccessful.

In the former case the insecticide (gamma benzene hexachloride) incorporated in the sulphur dust used for routine Oidium control, to the extent of 4 per cent active material, failed to cause a perceptible reduction in fruit set and in the latter case the only one of three chemicals tested when used at the lowest concentration which brought down the flowers also brought down the young undeveloped leaves.

Three water-miscible fungicides tested during the S.W. Monsoon season for the control of black stripe disease showed no adverse effect on the bark. In laboratory tests Antimucin gave the best control of Phytophthora palmivora.

For the control of bark rot the best results were obtained with Kankerdood.

These chemicals are to a certain extent poisonous to animals and care should be exercised in their use.

The growth of Fomes lignosus has been most effectively controlled in the laboratory by Tillex and field experiments with this chemical are now in progress.

The Plant Pathologist visited in November rubber estates in South India on which large scale experiments for the control of Phytophthora leaf fall had been carried out.

Observations have been continued on Oidium resistance of seedlings (and derived clones) which have clone LCB 870 as one parent.

Agronomy:

Much of the Agronomist's time has been spent on training new Assistant Staff for analytical work and on visiting estates to select new manurial experiment sites.

Further determinations of the zinc content of immature leaves of clones which show a wide range of susceptibility to Oidium heveae have confirmed results of earlier tests that the zinc status of rubber plants is not a major factor in their susceptibility to Oidium under field conditions in Ceylon.

Leaf analysis has provided a useful tool for defining sufficiency levels and deficiency levels of the major elements of plant food.

Experiments with weed killers have shown that a mixture of Amizole and Pentachlorphenol is particularly effective against grasses.

An experiment on Latex Stimulation comparing four proprietary stimulants showed the interesting fact that the effect of treatment results in a normal yield at the first tapping after the period of "wintering" rest. The results show a yield increase of almost double over a period of three months following treatment and little difference between the different mixtures.

The Assistant Agronomist has been engaged on a study of soil profiles in manurial trial areas on estates.

The chemical status of soil samples and the nutrient content of cover plants are also being studied. An interesting finding refers to Mikania scandens which has about five times the potash content of the three legume covers Pueraria, Centrosema and Desmodium.

Nodulation studies are in progress on Pueraria, Centrosema and Desmodium using rhizobial strains imported from Australia, Malaya and the U.S.A. Of eighteen rhizobial strains tested for nitrogen fixation two strains imported from Queensland, Australia have been shown to fix Nitrogen in Pueraria phaseoloides grown under pot culture conditions in sand and in Dartonfield soil.

Several new species of leguminous cover plants have been introduced for trial under field conditions.

A field experiment has been laid down to compare the effects on young rubber of leguminous and indigenous cover plants. A manurial trial is superimposed on this cover crop experiment to find out if a legume cover can replace, at least partially, fertiliser nitrogen.

Chemistry:

The Chemist was on overseas leave for a period of four months during the first half of the year during which time the Senior Technical Assistant was responsible for the work of the Department under the general supervision of the Director.

High priority has been given to the subject of copper contamination, mainly of scraps, in areas dusted with copper formulations for the control of leaf fall caused by Phytophthora palmivora.

Over one thousand scrap samples received from estates have been tested at Dartonfield and not more than 3.1 per cent of the processed scrap samples exceeded the R.M.A. specification of 8 p.p.m. of copper (the highest figure was just over 20 p.p.m.), a welcome improvement over the 1955 and 1956 figures.

Ciba 1 per cent dust, with sticker, would seem to be the most promising means of controlling Phytophthora leaf fall with regard to copper contamination of scrap rubber.

Rain guards have not proved an effective means of preventing contamination of scrap and an electroduster has not resulted in a significantly greater retention of copper on the leaf surface than the more conventional motor duster in general use on estates.

Fuller details of this work may be found in Information Leaflet C/58/1 issued early in 1958.

Advice to estates was mainly on procedures to be adopted for minimising pre-coagulation of latex on the tapping cut or in the cup and on various aspects of rubber manufacture.

Smallholdings:

The work of the Department showed a considerable increase during the year.

5,971 replanting permits covering 8,503 acres of smallholdings were issued and the field staff made 21,828 visits for lining and advisory work.

The Department established a record by organising the successful sulphur dusting of approximately 3,120 acres of smallholders' rubber during the Oidium season of 1957 as this comprises the largest acreage of smallholdings to be dusted in any one season.

Arrangements have been completed for the dusting of 4,800 acres of smallholdings in 51 co-operative groups during the 1958 Oidium season. This represents a total of 1,462 holdings and the owners of about 3,350 acres will be supplied with sulphur at subsidised rates.

A survey of the incidence of white root disease (Fomes lignosus) has shown the incidence of the disease in 19.7 per cent of replanted smallholdings. The extent of infection in individual holdings is, however, small and advice has been given on control measures to be adopted.

Rubber Instructors conducted 240 sheet making demonstrations and paid 1,917 visits to smoke houses besides giving numerous demonstrations of tapping and disease control. They also lined 2,636 holdings (3,628 acres) for soil conservation work and 3,465 holdings (4,856 acres) for planting holes.

Estate:

The planted acreage of the three Divisions of Dartonfield Group was approximately 1,026 acres at the end of the year, made up as follows:— Dartonfield (148-1-18), Nivitigalakele (167-2-27) and Hedigalla (709-2-27).

The Visiting Agent paid two visits during the year.

The immature rubber area was 652 acres and the acreage in tapping was 353 acres giving an average yield of 653 lb. of dry rubber per acre during 1957.

The incidence of both Oidium and Phytophthora was comparatively light during the year.

Fifty Dothidella-resistant clones introduced into Ceylon from the U.S.D.A. Plant Introduction Station, Miami, Florida, in December were budded in the Institute nurseries.

The Rubber Replanting Subsidy Scheme Nursery at Hedigalla, now in full production, continued under the supervision of the Estate Superintendent.

The planted acreage of the nursery increased by 25 acres to 77 acres 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 field experiments of the Botany Department now extend over 800 acres of a total planted acreage of 1,026 acres, on the three estates of the Rubber Research Institute. The greater proportion of this acreage is planted with material produced from hand-pollination programmes carried out each year from 1939. There are approximately 3,500 clones on trial established from a proportion of about 5,500 hand-pollinated seedlings.

The final criterion for assessing the value of this accumulation of planting material will be, primarily, yields of dry rubber. The trees have to be tested at least up to the time when they have been tapped on renewed bark. This will take a trial up to 20 years. An accumulation of such trials since 1939 will inevitably lead to test-tapping on a very large scale.

There are 50 acres on 9 commercial estates planted with hand-pollinated seedlings and five-tree-clones established from each seedling. This material is test tapped by an itinerating field staff, supervised by an Assistant Plant Breeding Officer who is also responsible for carrying out a pollination programme during the flowering season each year.

Experiments have also been initiated to investigate problems of more immediate importance to the planting industry; these consist of field trials on wide avenue planting systems, selective thinning out of initial high stands of budded and seedling rubber, crown budding with low yielding disease-resistant clones, and comparisons of yields of clones and clonal seedlings. Careful observations are made over all clonal trials for secondary characteristics, bark renewal, disease resistance, and wind damage.

The clone trials which are due for test tapping in 1958 will call for a cessation of test tapping in the older trials. A number of H.P. seedling trials, where the reliability of clone parents used in hand pollinations have now been sufficiently tested, will be taken out of yield recording rounds. A similar procedure is adopted with new clones which do not show promising yields during the first two to three years of test tapping. In this way it has been possible to cope with the increasing amount of new planting material which is due for yield recording each year.

The results for 1957 are presented and commented on in a combined report for the three estates of the Institute. As in previous years the information in the tables has been reduced to a minimum.

Advisory Work:

The Advisory Circulars on planting material, tapping systems, cover crops and the care of planting material in the field have reduced the advisory

correspondence of the Botany Department. These circulars have been modified to suit the needs of the Smallholdings Advisory Department and the Government Replanting Subsidy Scheme.

The Botanist continues to advise officers responsible for Colonisation and Land Allocation schemes on all aspects of rubber planting.

The correspondence of the department during the absence of the Botanist on 4 months end-of-contract leave was dealt with by the Director. The Botanist as Acting Director, from 13th September to the end of 1957, attended to the correspondence of the Botany Department in the latter capacity.

Breeding and Selection Work:

Hand Pollination Programme, 1957—Apart from the Oidium-resistant clone LCB 870, which has been used for breeding disease-resistant material since 1950, the material resistant to Dothidella and Phytophthora diseases imported into Ceylon in 1953 has not developed sufficiently for use in breeding work.

The pollination programme in 1957 was again restricted to more specific crosses between high yielding clones with vigorous growth and, in some cases, with partial resistance to Oidium and Phytophthora diseases. These crosses can be expected to further segregate high yielding and desirable secondary characteristics in the progeny.

Clones AVROS 163, LCB 1320, Mil 3/2, PB 5/139, PB 86, RRIC 52, Wag 6278 and Tjir 1 were used as female parents. Wherever possible high yielding RRIC clones, with clones PB 86, Tjir 1 and Wag 6278 as one of the parents, were used for backcrosses.

A total of 29,825 crosses were made and although an initial set of 1,114 (3.8%) was obtained only 695 plants have been established in the nurseries. Several fungicides were used against Pod-Rot caused by Phytophthora which is a serious limiting factor in our pollination work. Only clones established from these H.P. seedlings will be tested in future years.

Disease-Resistant Clones from Latin American Countries:

The Director of this Institute visited America in November/December, 1957, and was responsible for the introduction of one yard each of 50 disease-resistant clones, mostly of the IAN series, which have been found resistant to Dothidella and Phytophthora diseases.

The clonal material was received via the Commonwealth Mycological Institute, Kew, London, from the Plant Introduction Station, Coconut Grove, Miami, U.S.A.

Owing to delayed transport, and the worst possible budding weather in December 1957 in this country, the results from ten days old budwood have been encouraging. Out of a total of 845 buddings 47 per cent have turned out to be successful budgrafts representing 46 out of the 50 clones imported.

A specialist officer in plant breeding work from the U.S.A. will be assigned to this Institute by the United States Operations Mission to Ceylon to initiate the second stage of our breeding programme for the production of clones resistant to disease. It is hoped that this officer will take up duties about mid 1958.

Performance of clones and clonal seedlings:

A number of clonal seedling families has given outstanding yields, indicating the reliability of local and foreign clones as clone parents. A summary of the yielding capacity of the better clonal seedling families is given below. Most of the seedling family parent clones have been included in an isolated seed garden of 14 acres on Hedigalla Estate.

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

FAMILY Female	Male	No. of trees tapped	Year of Tapping 3rd	4th	5th	6th	7th	8th	9th	10th	11th
RRIC 8	× Mil 3/2	45-40									14.8
RRIC 8	× Wag 6278	38-37									19.7
RRIC 8	× Tjir 1	62-61							15.3		
PB 86	× PR 107	22					21.0				
RRIC 8	× Div 1	58					18.2				
PB 86	× Tjir 1	25					15.3				
TKD 113	× RRIC 8	13					19.3				
PB 86	× Wag 6278	18			17.9						
PB 86	× RRIC 8	54			13.8						
PB 86 crosses (1944)		144			13.4						
PB 5/139 crosses (1944)		153			14.9						
PB 5/139 crosses (1945)		437		13.4							
PB 86 crosses (1945)		401		12.2							
AVROS 163	× RRIM 519	84		6.6							
AVROS 163	× RRIM 506										

Local Clones:

The yields of local clones, in a year with long periods of drought and unprecedented rainfall at the end of the year, have been quite promising and the results for 1957 are given in the attached table. The selected RRIC clones are most promising.

Clones 2 to 7 have been tested with 75 trees of each clone, in plots of 25 trees, in a poor area on Hedigalla Estate in a second trial. Clones RRIC 5, 6 and 7 have given over 12 lbs. per tree per year for 1957 in the 5th year of tapping.

The four original budgrafts of clone RRIC 52 planted in 1944 have given 23.9 lbs. dry rubber per tree per year in 1957. The trees were first tapped in May, 1951. It is the most vigorous growing clone we have but does not belong to the highest yielding class, at least in the early years. The clone is shade tolerant and partially resistant to Oidium leaf disease. In a later trial with 150 trees it has given 3.3 lbs. d.r. per tree, per year in the first tapping year on 67 per cent tapping intensity. Clone PB 86 in the same trial has given 5.5 lbs.

Clones Nab 12, 15 and 20 have given yields of 14 to 18 lbs. rubber per tree per year in the 13th year of tapping, clone PB 86 has given 21 lbs. in the same trial. Clones Nab 12 and 15 are, however, comparatively free of Phytophthora diseases. Clone PB 86 is definitely susceptible.

Foreign Clones:

Clone PB 86 has maintained the first place in yielding capacity in a number of our clone trials.

Clone AVROS 255 has given the best yields of 14 to 15 lbs. dry rubber per tree per year in two of our older trials; clone PB 86 was not included in these trials. In these same trials the yields of clones PB 6/50, PR 107, RRIM 513, RRIM 501, RRIC 1, and LCB 1320 fully justify their inclusion in our list of recommended planting material for commercial planting.

A selection of Chemara clones planted in 1950 was test tapped from April, 1957. Clone CH 26 has given 8.1 lbs. d.r. per tree per year for 1957 compared with 6.5 lbs. for clone PB 86. This Chemara clone is worth an early trial on commercial estate. Under the conditions of this experiment clone CH 26 is the better yielding clone ; under Malayan conditions it is susceptible to wind damage.

Yields of Selected R.R.I.C. Clones in 1957 in lbs. d.r. per tree per year Tapped S/2, d/2, 100%

Clone	Year of planting	Year of Tapping											
		1	2	3	4	5	6	7	8	9	10	11	12
RRIC 9	1941											27.4	
,, 22	,,											32.2	
,, 13	,,											29.8	
,, 51	,,											22.3	
,, 17	,,											19.1	
,, 45	1944							41.2					
,, 41	,,							37.0					
,, 28	,,							36.0					
,, 31	,,							28.8					
,, 40	,,							27.7					
,, 39	,,							25.8					
,, 59	,,							25.8					
,, 60	,,							23.7					
,, 42	,,							21.8					
,, 75	1943							32.3					
,, 74	,,							30.9					
,, 47	,,							30.5					
,, 46	,,							29.0					
,, 37	,,							28.8					
,, 36	,,							27.3					
,, 76	,,							26.5					
,, 79	,,							26.0					
,, 33	,,							23.4					
,, 54	1946					21.3							
,, 57	,,					18.8							
,, 55	,,					16.5							
,, 78	1947				23.0								
,, 64	,,				21.2								
,, 65	,,				18.3								

Wide Avenue Systems of Planting:

There has been considerable controversy on the matter of the spacing of contour avenue planting among rubber growers in this country. There is

little doubt that, in the difficult rubber planting terrain of the greater proportion of our rubber growing land, some form of approximately level contour planting is essential to minimise labour requirements on tree to tree attention and for reducing the cost of production in the future. Planting distances of 8′ × 30′ and 10′ × 24′ are already being adopted in this country for both replanting and new planting on steep land.

In the case of clonal seedlings with initial stands of 240 trees per acre, for final selective thinning down to a permanent stand of about 130 trees per acre, it is necessary to plant closer in the rows, for example 6′ × 30′. Square planting is not adapted to selective thinning out of high initial stands.

An experiment with budded rubber, planted 6′ × 45′ in 1949 with 31 clones, has given the following yields in the second tapping year for the better known clones:—

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

Clone		No. of trees tapped	Yield in lbs. d.r. per tree per year
PB 86	...	128-136	5.5
Nab 17	...	127-154	5.3
PB 6/50	...	156-157	5.2
RRIM 513	...	117-134	5.2
RRIM 501	...	104-124	4.8
Nab 20	...	134-138	4.7
RRIM 504	...	104-113	4.0
RRIC 52	...	135-136	3.3
Lun N	...	96-110	3.5

The stand per acre was reduced to 150 trees per acre in 1957, the final permanent stand will be about 130 trees per acre.

The above clones have given very satisfactory results, especially clone PB 86. The long term effects of this wide-avenue planting will be awaited with interest. After 8 years' growth the leaf canopies have not joined up between the rows.

Crown Budding Experiments:

Hedigalla Estate—There are strong indications that high yielding crowns tend to increase the yields of lower yielding seedling and budded centre sections.

Twin seedlings crown-budded with clone Tjir 1 and LCB S70 show that the twin with clone Tjir 1 as a crown is giving the better yields.

In a large scale crown-budding experiment with over 10 acres of high and low yielding clones as crowns and centre sections, clone PB 86, the high yielding clone, has improved the yields of clones Tjir 1, AVROS 256, PM 17, Glen 1, and Rub 393 as budded centre sections, while the low yielding clone PM 17 has depressed the yields of the clones when used as a crown.

In the same experiment 108 comparisons of crown budding at 5′ and 8′ show no differences in yields of the budded centre sections.

The yield figures for the full experiment will be statistically analysed to test the significance of these results and for a study of any interactions.

A large scale crown budding experiment, 1942 Clearing, Dartonfield:

Five clones Nab 12, 15, 20, RRIM 501 and PB 86 with 300-tree-plots replicated fourfold have half the trees of each plot crown budded with clone LCB 870 at a height of 8 feet. The growth figures, summarised below, show that the crown-budded trees are 4 inches behind in girth 3 years after crown budding.

	Mean girth in inches	
	Control	Crown budded
Prior to crown budding in 1954 ...	6.4	6.3
August 1955	10.9	7.6
,, 1956	14.6	10.3
,, 1957	18.4	14.3

The trees not crown-budded will be ready for tapping in 1958.

1957 Planting Programme:

In the South-West Monsoon planting season, 40 acres were replanted on two estates in the Kalutara District with 300-tree-plots of each of the following clones:—

Estate No. 1 10 acres, Clones RRIM 607, IRCI 2 and 3.
TR 1406, AVROS 529.

Estate No. 2 30 acres, Clones RRIM 602, 603, 612, 622, 623.
TR 1542, and 1548.
WR 101, PR 248, and 254.
AVROS 1734 and 2037.
RRIC 60, 61, 75 and 76.

Clones PB 86 was used as control in the above clone trials.

In the North-East Monsoon planting season a further block of suitable cleared land on our Hedigalla Estate was planted with the following material:—

(1) 169 clones established from 1954/55 H.P. seedlings.

(2) 12 clones established from the 1945 H.P. seedlings in 1947 clearing, Dartonfield.

(3) 15 clones established from 1945 H.P. seedlings, in the 1947 clearing, Hedigalla.

(4) 25 clones established from crosses with Oidium-resistant clone LCB 870 made in 1951.

The above clones were planted as 10-tree-clones with clone PB 86 as a control.

The following local and foreign clones completed the 1957 new planting at Hedigalla, clones CH 26, RRIC 51 and 64, clone PB 86 (control).

DETAILED REPORT

Staff:

Mr. C. A. de Silva, Botanist, was away on end-of-contract leave from 20th January to 20th May, 1957. During this period the work of the Department was under the general supervision of the Director.

The Botanist acted for the Director from 13th September and continued in this capacity up to the end of 1957.

On the resignation of the Agronomist, Mr. D. H. Constable, on the 13th of December, the Botanist supervised the work of the Agronomy Department in addition to his own duties.

Mr. D. M. Fernando, Assistant Plant Breeding Officer, was on duty. He has been responsible for initiating the 1957 pollination programme, and supervising the general work in connection with breeding and selection.

Mr. L. P. Chandrasekera, Research Assistant, continued his postgraduate course at the Cambridge University on a Colombo Plan scholarship.

Messrs. W. G. V. Fernando and C. Amaracone, Technical Assistants, were on duty during the year under review; the latter is stationed at Nivitigalakele Estate.

Advisory Work:

The advisory correspondence of the Botany Department was dealt with by the Director during the absence of the writer on end-of-contract leave in 1957.

The Advisory Circulars issued by the Smallholdings Advisory Department and Government Replanting Subsidy Scheme have considerably reduced the correspondence of the Botanist. The Botany Department has made substantial contributions to these circular publications on planting material, tapping systems, cover crops, methods of opening land and systems of planting.

The Botanist continues to advise the officers responsible for Land Allocation schemes on all aspects of rubber planting.

A considerable amount of time is taken up for discussions with visitors interested in rubber planting. The visits made by trade delegations, and visitors from overseas, and local estate agencies have considerably increased in recent years.

Inward correspondence	...	243
Outward correspondence	...	198

Visits:

The Botanist, in his capacity as Acting Director, attended 11 meetings of the Rubber Replanting Advisory Board, one meeting of the Central Board of Agriculture and one meeting of the National Planning Council.

A meeting of departmental heads on the occasion of the visit of the Russian Trade Delegation was attended, on the invitation of the Hon. the Minister of Agriculture and Food.

Vacation Leave:

Casual	...	...	14 days
Vacation	...	...	nil
End-of-contract leave	...	...	4 months.

Publications:

Attention was given to the following Advisory Circulars prior to reprinting in the writer's capacity as Acting Director:

Advisory Circular No. 38—Planting and Aftercare of Budded Stumps and Stumped Budgrafts.

Advisory Circular No. 46—White Root Disease of Hevea.

Advisory Circular No. 49—Root Disease in Replanted Areas.

A short report was presented to the National Planning Council on the future development of the Rubber Research Institute and its extension services.

Breeding and Selection Work:

The first organised hand-pollination programme for obtaining high yielding clonal seedlings and clones was carried out in 1939, under the supervision of a Geneticist. A hand pollination programme was carried out each year, during the flowering season up to 1945, except 1942. The best available foreign and local clones were used as male parents and high yielding clones with the best seed setting qualities were selected as female parents. Clone PB 86 as a prolific seed bearer was used on a large scale. Clone Tjir 1 was also a useful female parent in this respect.

From about 3,500 clones that have been established from hand-pollinated seedlings, the early test-tapping results have produced about 80 selected RRIC clones. The best of these clones are giving yields over 30 lbs. dry rubber per tree, per year. In 1957 clone RRIC 45 has given 41 lbs. dry rubber per tree, per year.

The test tapping of hand-pollinated seedlings has given us most valuable information on the usefulness of clones as seed parents. We can now recommend seed of clone Tjir 1 and crossed seed of several clones, as reliable "mixed seed" for commercial planting. Such seed types are obtainable from commercial estates.

With the resignation of the Geneticist in 1945 the Botanist, in collaboration with the Mycologist, has carried out pollination programmes from 1953. A commencement was made by the Mycologist for breeding clones resistant to Oidium heveae in 1950 by crossing the Oidium-resistant clone LCB 870 with high yielding clones, especially clone PB 86. We have an useful collection of these hand-pollinated seedlings in our experimental plantations.

In 1957, 25 clones have been established from the best yielding seedlings of the early LCB 870 crosses planted in 1952 at Dartonfield. The seedlings have not yet been finally tested for resistance to Oidium heveae. There are, however, strong indications that a few may be resistant judging by the absence of secondary Oidium in the first 5 years of growth. It will be necessary to test all the selected clones at high elevations without sulphur dusting, as a final test for resistance to Oidium.

The Botanist has also, with the help of a plant breeding officer, carried out hand pollinations each year from 1953 for further segregating high yielding characteristics in more specific crosses. The seed setting qualities of the clonal parents are comparatively unknown and the seed-set has, therefore, been limited. Nevertheless, this seed can be expected to be an improvement on the first generation crosses. In recent years backcrosses of various types have been made for the production of better high yielding clones. The clonal seedlings themselves at this stage are not of much practical importance. Attention is concentrated on testing clones established from these seedlings.

The breeding and selection work carried on in the past have given a useful collection of high yielding clones. It is now necessary to focus our future pollination programmes on the problem of breeding high yielding clones, which are resistant to diseases caused by Oidium heveae and Phytophthora palmivora and also for providing high yielding clones which are resistant to Dothidella ulei, for the future.

We have in recent years introduced into our nurseries several clones of Brazilian origin which are resistant to both Dothidella ulei (South American Leaf Blight), and Phytophthora diseases. In December 1957, we received further budwood material from the Plant Introduction Station, Coconut Grove, Miami, U.S.A., through the efforts of our present Director who, on his visit to America, was responsible for a collection of the best available material, most of which are second generation crosses in the development of disease-resistant clones in Latin American Countries. Some of these are also comparatively high yielding material and will increase the chances of breeding high yielding clones also resistant to the diseases, which now call for expensive methods of control with imported fungicides.

The budwood was cut on 14th December in Miami, Florida, and taken over to England by the Director on 17th December, where it was further disinfected before despatch to Ceylon. Owing to flight cancellations, the material finally reached Ceylon on the 23rd of December. The budgrafting in our nurseries was carried out in the worst possible wet weather conditions due to an unprecedented rainfall in Ceylon in December 1957. The results up to the stage of cutting back of stocks of successful budgrafts are presented below. The best available budwood was rather immature when cut and had deteriorated somewhat from the effects of two disinfections and delayed transport. The results have on the whole been quite satisfactory.

Twenty five Latin American Clones of the F and FX Series were obtained from the R.R.I. of Malaya in 1955. Four-year-old trees of Clones PR. 107 in a 4 acre area at Hedigalla Estate have been successfully crown-budded with a selection of 15 of these disease-resistant clones, for use in pollination work as early as possible. Provision has been made in the layout to test the effects of the crowns on the centre-sections by including the necessary controls. Observations will also be made on the susceptibility or otherwise of these crowns to Odium heveae.

A new Plant Breeding Section will be set up in 1958 with the services of a plant breeder, with experience in Hevea breeding work in Latin American countries, who will be able to initiate a programme for the breeding of high yielding disease-resistant clones with the disease-resistant material that has been introduced into our nurseries since 1953. The plant breeder concerned will be assigned to this Institute for a two year period by the U.S. Operations Mission to Ceylon.

Results of budgrafting one yard each of fifty disease-resistant clones imported from U.S.D.A. Plant Introduction Station in December, 1957.

No. of clones	Average number of budgrafts per yard of budwood	Total number of budgrafts	Total number of successful budgrafts	% successes
50	17	845	396	47%

46 out of the 50 clones of the FX and IAN series received from America are represented in the successful budgrafts obtained.

Test Tapping of Clones and Clonal Seedlings:

The test-tapping of clonal seedlings in 1957 has been restricted to families which have a sufficient number of trees that could give some indications of the reliability of the clones used as seed parents in pollination programmes.

It is possible to find some of the reliable clone parents, as indicated in these test tapping results, on commercial estates which can supply the desired types of mixed clonal seed for commercial planting. High initial stands of these mixed clonal seedlings and early selective thinning out on growth and yield characteristics will ensure high average yields per acre. The test tapping results will also indicate the desirable clone parents for inclusion in seed gardens.

The test-tapping of selected clones have been further reduced in 1957 and only the most promising clones which have retained their high yields in later years of tapping are test tapped. It is known, however, that the order of merit of high yielding clones, tested on a small number of trees of the original budgrafts, can change somewhat according to climate, the soil conditions in the various rubber planting districts of Ceylon and the cultural operations adopted on individual estates. It is, therefore, necessary that each estate should plant a selection of the best available clones in monoclone blocks on a small scale. Such trials, while they give high average yields, will indicate clones which are best suited to local conditions. Budwood of recommended cones is distributed to a larger number of estates each year for this purpose.

The yield results of selected clones and clonal seedling families are presented in Tables I to XIIB.

TABLE I

Results of 1939 H.P. Seedling Crosses, 1941 Clearing, 7¼ Acres Nivitigalakele, Tapped S/2, d/2, 100% from 1947

Seedling Parentage	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year				B.B. cases	Bark-Rot and Canker cases	Wind-damage cases
		1954	1955	1956	1957			
RRIC 8 × Mil 3/2	43-40	16.5	12.6	15.1	14.8	16	3	1
RRIC 8 × Pil A 44	33-36	11.6	10.9	11.2	10.6	9	—	—
Pil A 44 × Wag 6278	17	10.6	9.6	12.0	10.2	1	—	—
RRIC 8 × Wag 6278	38-37	21.5	20.5	22.2	19.7	10	1	2
Pil A 44 × RRIC 8	12-14	8.1	7.3	7.5	7.2	6	—	—
Budded Wag 6278 (Control)	39-40	14.1	13.6	12.9	14.1	3	—	1

TABLE II

Results of the 1940 H.P. Seedling Crosses, 1942 Clearing 4 3/8 Acres, Nivitigalakele. Tapped on S/2, d/2, 100% from 1949.

Seedling Parentage	No. of trees tapped	Yield in lbs. d.r. per tree per year.				B.B. cases	Bark-Rot and Canker cases	Wind-damage cases
		1954	1955	1956	1957			
RRIC 8 × Hil 28	67-63	10.2	10.6	12.2	11.9	12	—	1
RRIC 8 × Tjir 1	62-61	14.0	14.9	18.6	15.3	17	—	5
Boundary trees								
RRIC 8 × Hil 28	59-57	9.9	10.9	13.3	12.7	12	2	2
RRIC 8 × Tjir 1	23-22	13.5	14.7	17.6	15.8	4	1	8

TABLE III

Results of Selected Five-tree-clones established from 1939 H. P. Seedlings, 1941 Clearing, Nivitigalakele Tapped S/2, d/2, 100% from 1947

Clone	Parentage of seedling mother tree	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year					B.B. cases	Bark-Rot and Canker cases	Wind-damage cases
			1954	1955	1956	1957	Wag 6278 (control '57)			
RRIC 9	RRIC 8 × Mil 3/2	4	19.6	22.6	19.1	27.4	12.6	1	—	—
,, 22	,, × Wag 6278	2	19.2	22.1	28.5	32.2	17.9	1	—	2
,, 13	,, × Mil 3/2	3	17.8	21.3	17.2	29.8	14.7	2	—	—
,, 24	,, × Mil 3/2	5	16.5	21.1	16.3	17.8	9.9	—	—	—
,, 16	,, × Mil 3/2	5-4	18.9	19.7	19.1	23.9	16.3	3	—	—
,, 17	,, × Mil 3/2	3	16.6	18.0	17.0	19.1	17.8	2	—	1
,, 19	,, × Mil 3/2	4	20.1	18.0	18.0	16.8	23.6	1	—	1
,, 51	,, × Mil 3/2	5	19.2	15.1	20.1	22.3	7.8	1	—	—

TABLE IV

Results of Selected Three-tree-clones established from 1940 H.P. Seedlings in 1944 Clearing, Nivitigalakele Tapped S/2, d/2, 100% from 1951.

Clone	Parentage of seedling mother tree	No. of trees tapped	Yield in lbs. d.r. per tree per year					B.B. cases	Bark-Rot and Canker cases	Wind-damage cases
			1954	1955	1956	1957	Wag 6278 (control 1957)			
RRIC 45	RRIC 8 × Tjir 1	3	24.3	37.3	39.6	41.2	15.2	—	1	—
,, 41	,, × ,,	2	33.2	37.3	33.8	37.0	12.3	2	—	—
,, 42	,, × ,,	1	24.7	27.1	25.3	21.8	12.0	1	—	—
,, 31	,, × ,,	3	21.9	25.7	24.7	28.8	13.3	—	1	—
,, 28	,, × Hil 28	1	32.0	25.1	37.1	36.0	14.6	1	—	2
,, 40	,, × ,,	3	17.9	24.7	21.9	27.7	12.5	—	—	—
,, 39	,, × Tjir 1	2	24.8	23.2	27.7	25.8	12.7	—	—	1
,, 59	,, × Hil 28	3	17.7	21.2	20.4	25.8	18.3	—	—	—
,, 60	,, × ,,	3-2	—	—	24.6	23.7	14.0	2	—	—

TABLE V

Results of 1941 Hand Pollinated Seedling Crosses, 1943 Clearing, Hedigalla

Trees tapped S/2, d/2, 100% from September, 1950.

Seedling Parentage	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year				B.B. cases
		1954	1955	1956	1957	
PB 86 × PR 107	22	18.8	19.0	21.2	21.0	1
TKD 113 × RRIC 8	13	13.7	16.5	18.6	19.3	1
RRIC 8 × Diy 1	58	11.9	14.7	17.2	18.2	2
,, × Tjir 16	14	12.4	16.3	15.8	17.5	1
PB 86 × M. 162	13	12.3	16.8	17.7	17.5	1
M 3 (RR 9) × RRIC 8	11	9.7	11.4	13.7	17.2	
Diy 1 × Mil 3/2	15	11.0	10.1	15.1	16.0	
PB 86 × Tjir 1	25	11.2	12.8	14.9	15.3	
Budded control Wag 6278	24	12.8	11.2	12.6	16.4	

TABLE VI

Results of selected Five-Tree-Clones established from 1941 H.P. Seedlings, 1943 Clearing, Hedigalla.

Tapped S/2, d/2, 100% from September, 1950.

Clone	Parentage of seedling mother tree	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year				B.B. cases
			1954	1955	1956	1957	
RRIC 75	RRIC 8 × Tjir 16	3	23.0	30.5	37.6	32.3	1
,, 74	PB 86 × PR 107	2	18.6	20.7	19.3	30.9	3
,, 47	Diy 1 × Mil 3/2	4	21.8	26.7	26.9	30.5	—
,, 46	PB 86 × PR 107	3	23.3	25.6	23.0	29.0	—
,, 37	RRIC 8 × Diy 1	4	21.7	29.5	18.7	28.8	—
,, 36	PB 86 × PR 107	4	29.0	20.6	29.8	27.3	—
,, 76	TKD 113 × RRIC 8	4	18.3	21.5	26.4	26.5	—
,, 79	PB 86 × M 162	5	16.4	20.4	22.3	26.0	—
,, 33	RRIC 8 × Dal 5315	5	21.3	24.3	23.8	23.4	2 canker cases
,, 35	PB 86 × PR 107	5	18.0	16.2	20.3	21.3	—
,, 32	RRIC 8 × H 24	5	13.5	15.5	17.2	20.4	
,, 50	Tjir 1 × PB 86	4	18.6	21.0	22.9	18.3	4
,, 38	PB 86 × PR 107	4	20.3	17.0	17.6	18.2	1

TABLE VII

Results of the 1943 H.P. Seedlings, 1946 Clearing, Hedigalla

Tapped S/2, d/3, 67% from 1953

Tapped S/2, d/2, 100% from 1956.

Seedling Parentage	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year.				B. B. cases	Wind-damage cases
		1954	1955	1956	1957		
PB 86 × Tjir 1	20	4.8	5.6	8.0	11.5	2	—
,, × Mil 3/2	9	5.6	5.0	10.7	12.7	1	—
,, × RRIC 8	54	5.8	6.7	11.9	13.8	3	10
,, × Wag 6278	18	7.5	8.7	15.8	17.8	1	—
Tjir 1 Budded Control	62	4.9	5.7	11.5	12.8	3	12

TABLE VIII

Results of Clones established from 1943 H.P. Seedlings

1946 Clearing, Hedigalla.

Tapped S/2, d/3, 67% from 1953

Tapped S/2, d/2, 100% from 1956.

Clone	Parentage of Seedling mother tree	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year			
			1954	1955	1956	1957
RRIC 54	PB 86 × Wag 6278	5	9.3	12.8	20.9	21.3
,, 57	,, × RRIC 8	5	8.1	10.3	14.7	18.8
,, 55	,, × Wag 6278	5	12.5	16.5	22.4	16.5
,, 62	,, × RRIC 8	5	8.0	10.7	12.1	15.4
No. 299	,, × Mil 3/2	5	7.8	8.8	14.7	20.0
,, 301	,, × ,,	4	6.7	9.8	16.9	18.1
,, 258	,, × RRIC 8	5	7.7	9.2	13.2	18.0
,, 229	,, × ,,	5	6.5	7.8	13.0	17.1
,, 237	,, × ,,	5	—	—	—	15.5
,, 260	,, × ,,	5	7.6	8.0	14.2	15.5
,, 268	,, × Wag 6278	5	6.6	8.3	16.6	15.4

TABLE IX

Results of the 1944 H.P. Seedlings, 1946 Clearing, Hedigalla,
Tapped S/2, d/3, 67% from 1953
Tapped S/2, d/2, 100% from 1956.

Seedling Parentage	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year.				B.B. cases	Bark-Rot and Canker cases	Wind-damage cases
		1954	1955	1956	1957			
PB 5/139 × TKD 113	153	8.1	8.4	13.6	14.9	6	2	5
PB 86 × TKD 113	144	5.3	6.8	12.3	13.4	6	1	—
,, × Glen 1								
,, × BR 2								
,, × Mil 3/2								
,, × Dal 5315								
,, × BD 10								
,, × Pil B 84								
,, × PB 5/60								
,, × Wag 6278								
,, × PB 5/139								
,, × Hil 28								
,, × AVROS 163								
,, × PB 6/50								
,, × Tjir 1								
TKD 113 × Tjir 1	43	7.5	9.1	14.1	15.0	5	2	—
,, × RRIC 5								
,, × Glen 1								
,, × Hil 28								
Mean		7.0	8.1	13.3	14.4	—	—	—

TABLE X

Results of Clones established from 1944 H.P. Seedlings
1947 Clearing, Hedigalla
Tapped S/2, d/3, 67% from June, 1954
Tapped S/2, d/2, 100% from 1957.

Clone	Parentage of Seedling mother tree	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year		
			1955	1956	1957
RRIC 78	PB 5/139 × TKD 113	5	11.3	23.0	23.3
,, 74	,, × ,,	5	15.0	22.6	21.2
,, 65	,, × ,,	5	8.6	15.2	18.3
,, 66	,, × ,,	5	5.8	13.9	15.2
,, 63	,, × ,,	5	8.4	10.9	12.3
No. 109	,, × ,,	5	8.0	14.8	18.5
,, 56	,, × ,,	5	6.9	13.1	17.3
,, 134	,, × ,,	5	5.6	13.3	16.4
,, 17	,, × ,,	5	7.6	14.9	16.1
,, 136	,, × ,,	5	5.9	13.8	15.9
,, 293	PB 86 × PB 5/60	5	7.2	13.2	15.6

TABLE XI

Results of 1945 H.P. Seedlings, 1947 Clearing, Hedigalla
Tapped S/2, d/3, 67% from 1954
Tapped S/2, d/2, 100% from 1957.

FAMILY Male	Female	No. of trees tapped 1957	Yield in lbs. d.r. per tree per year. 1954	1955	1956	1957	Brown-Bast cases	Bark-Rot and Canker cases	Wind-damage cases
AV 157	× AV 352	4	—	1.3	3.8	7.4			
AV 163	× AV 255								
,,	× BR 2								
,,	× RRIM 519								
,,	× RRIM 506	384	1.9	3.1	4.4	9.0	17	23	1
,,	× Tjir 1								
,,	× RRIM 514								
RRIM 514	× AV 163								
Selfed AV 613		4	—	2.0	4.5	7.4			
BR 2	× Tjir 1								
,,	× AV 255								
,,	× RRIM 506	192	—	3.5	5.7	8.0	6	1	
,,	× RRIM 514								
RRIM 514	× BR 2								
PB 5/139	× RRIM 500								
,,	× RRIM 501								
,,	× RRIM 504								
,,	× RRIM 506								
,,	× RRIM 511								
,,	× RRIM 513								
,,	× RRIM 518								
,,	× RRIM 519	557	3.0	5.2	7.8	10.2	18	3	2
,,	× RRIM 520								
,,	× BR 2								
,,	× KD 2								
,,	× BD 10								
,,	× PB 6/50								
RRIM 506	× PB 5/139								
RRIM 504	× PB 5/139								
PB 86	× AV 163								
,,	× RRIM 519								
,,	× RRIC 4								
,,	× RRIC 5								
,,	× RRIC 6								
,,	× RRIC 7								
,,	× AV 255	655	2.8	4.5	7.1	10.9	17	5	
,,	× AV 352								
,,	× AV 157								
,,	× PB 23								
,,	× RRIC 2								
,,	× PB 86								
Tjir 1	× RRIM 514								
	× RRIM 506	263	3.0	3.4	5.6	9.1	3	2	1
	× AV 255								
PB 86 supplies (illeg.)		547	1.8	3.0	4.8	7.5	5	10	
Tjir 1 supplies		248	—	2.1	3.8	6.3	1	5	
Glen 1 supplies		42	—	1.8	3.1	5.3			1
Mean	(2, 896 trees)			**3.8**	**5.9**	**8.1**			

Trials of H. P. Seedlings and Derived Five-tree-clones on Outside Estates.

A total of 1100 hand-pollinated seedlings and of five-tree-clones established from each of these seedlings was planted in 1947 and 1948 on 9 commercial estates, in field trials of 100 H.P. seedlings and 100 five-tree-clones in adjacent areas.

Test-tapping has been carried out from 1954 under the supervision of the Assistant Plant Breeder and a trained itinerating field staff. The total of 1160 clones have been reduced to about 100 clones for test tapping. Sufficient information on the performance of the clonal seedling families has now been gathered over a period of four years of test-tapping and it is proposed that test-tapping be discontinued from 1958.

There has been a considerable improvement in the yields of clones and seedling families in 1957. The year has been marked by extreme dry weather periods and unprecedented rains and floods at the end of the year. Weather on the whole has been favourable for intake of crop.

The test tapping results for clones and clonal seedlings are presented in Tables XII A and XII B.

Table XII A

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

Tapped S/2, d/2, 100% in 1957

+Tapped S/2, d/3, 67%

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

TABLE XII B

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 Female	Male	No. of trees tapped 1957	1954	1955	1956	1957
PB 5/139	× RRIM 520	410	9.8	11.0	10.3	13.4
,,	× BR 2					
,,	× RRIM 501					
,,	× ,, 504					
,,	× ,, 506					
,,	× ,, 513					
,,	× Tjir 1					
,,	× RRIM 514					
,,	× PB 6/50					
,,	× BD 10					
,,	× KD 1					
,,	× RRIM 511					
,,	× ,, 519					
,,	× ,, 518					
,,	× ,, 500					
RRIM 506	× PB 5/139					
RRIM 514	× PB 5/139					
PB 86	× RRIC 5	379	9.1	11.0	11.8	12.2
,,	× RRIC 7					
,,	× AVROS 255					
,,	× RRIM 519					
,,	× AVROS 352					
,,	× AVROS 157					
,,	× PB 23					
,,	× AVROS 163					
,,	× RRIC 4					
AVROS 163	× RRIM 519	74	—	6.0	6.3	6.6
,,	× RRIM 506					
RRIM 514	× BR 2	16	—	9.4	9.1	6.5
Total		879				
Mean Yields			9.5	10.8	10.6	12.2

Growth Measurements in Immature Areas.

Girth measurements, taken at a height of 3 feet from the union for budded trees and 3 feet from ground level for seedling trees, are the criteria for standards of growth in immature areas. The first series of girth measurements are taken at the end of the second year of growth.

In a good replanted area where the land has been ameliorated in recent years by systematic manuring with artificials and green manuring with leguminous cover crops, an average girth of 5 to 6 inches at the end of the second year of growth is considered as normal good growth for both budded and seedling trees. The seedlings are planted at a much higher

initial stand per acre than budded rubber. After a seedling area is selectively thinned out on growth characteristics the average girth will be about a year ahead of the budded rubber in growth.

A rate of girth increase of 3 to 3½ inches per year can be considered as normal good growth up to maturity. The rate of growth can be expected to scale down considerably when the trees are brought into tapping.

Under conditions of growth in Ceylon budded trees can be tapped at 6 to 7 years of age and seedling trees at 5 to 6 years of age, if the criterion of tappable girth is fixed at 20 inches.

It should be noted that all the experimental areas since 1939 have been opened out as new clearings in jungle land at our Nivitigalakele and Hedigalla Estates. Although this land is considered as virgin jungle the fertility of the land is generally below that found in replanted areas. Normal good growing standards appear after about the 4th year of growth, when the new clearings have had sufficient time to benefit by the decay of timber and debris left on the land. The systematic cultural operations, which include manuring with artificial fertilisers containing Nitrogen, Phosphate and Potash, and the establishment of leguminous ground covers, are also essential contributory factors to good growth, especially during the immature stages.

The girth measurements taken in 1957 are summarized below:—

Clone Trial, 1953 Clearing, 10 acres, Nivitigalakele Estate.

Two RRIC clones No. 44 and 45 were budded in the field in 1955 on clonal seedlings from Sorana Estate planted in May, 1953. The two clones budded on two-year old seedling stocks show outstanding growth at two years of age. A limited number of holes in this area were planted with budded stumps of clone PB 86 in 1953. Girth measurements were taken in July 1957 and the results are summarized below.

Clone	No. of trees	No. of supplies	No. of trees excluding supplies	Mean girth in inches
RRIC 44	708	51	657	7.0
RRIC 45	724	25	699	7.0
PB 86	60	60	60	12.5

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

This area was planted in May, 1954 and girth measurements were taken in July, 1957. There are 200 trees of each clone in 40 tree plots. The results are summarised for 1956 and 1957.

Clones	IRCI 10	IRCI 7	PB T 207	PB 6/5	PB 24/3	PB 28/59	PB 24/51	RRIM 501
Mean girth in inches 1957	10.3	11.7	10.7	10.1	10.0	11.4	9.9	10.7
Mean girth in inches 1956	6.3	6.5	5.8	5.9	5.4	6.6	5.4	5.5
Girth increase 1956/57	4.0	5.2	4.9	4.2	4.6	4.8	4.5	4.7

The growth of selected clones in a new clearing is exceptionally good as the trees are planted rather sparsely on somewhat rocky land with fertile pockets of soil.

1952, Five-tree-clone Trial, 25 Acres, Hedigalla Estate.

645 five-tree-clones were established from a proportion of the 5000 clonal seedlings obtained from the 1945 hand-pollination programme and were planted in October-November, 1952. Girth measurements were taken in October-November, 1957. The trees in this area show an average girth of 13.8 inches at 5 years of age. The girth increase for the first 8 months of 1957 is 2.0 inches, which is quite satisfactory, although the average girth of 13.8 shows growth conditions below the standards of normal good growth. The quantities of manure per tree have been considerably increased in 1957 to bring the trees up to standard.

1953, Large Scale Clone Trial, 114¾ Acres, Hedigalla Estate.

Each clone is replicated five to sixfold in 200 tree plots, which will be used as tapping tasks in later years. The clearing was planted in May-June 1953. Girth measurements were taken of every 5th tree, permanently marked for yearly measurements in June. The results for 1956 and 1957 are summarized below.

1953 Large Scale Clone Trial
Average Girth Measurements in Inches

Clone	Girth 1956	Girth 1957	Increase 1956/57	Clone	Girth 1956	Girth 1957	Increase 1956/57
RRIC 1	5.5	8.7	3.2	LCB 1320	8.8	13.7	4.9
,, 2	6.7	10.9	4.2	Lun N	7.6	11.5	3.9
,, 3	6.9	11.0	4.1	RRIM 501	7.2	11.4	4.2
,, 4	6.3	10.2	3.9	RRIM 513	7.2	10.5	3.3
,, 5	7.5	12.2	4.7	LCB 870	6.8	10.4	3.6
,, 6	5.5	9.3	3.8	Mil 3/2	6.5	10.2	3.7
,, 7	7.5	11.9	4.4	Tjir 1	6.3	10.2	3.9
				Wag 6278	6.2	9.9	3.7
Mean	6.6	10.6	4.0	Mean	7.1	11.0	3.9

The rate of growth of all clones in this clearing has recovered and is now up to very good standards of growth in 1956/57. The growth of the local RRIC clones compares very favourably with that of the foreign clones. Clone LCB 1320 is known to be a most vigorous grower and shows a girth increment of 4.9 inches.

1954 Large Scale Clone Trial, 148 Acres, Hedigalla Estate.

Clone RRIC 16 to 37 are planted in this area in single monoclonal blocks of 800-840 trees of each clone to provide 4 tapping tasks for future recording of yields. Clones RRIM 501, PB 86 and IRCI 10 are used as controls. Every 10th tree has been permanently marked for annual girth measurements. The rate of growth up to the third year is not up to normal standards of good growth. The average girth increment for 10 months growth is only 1.8 inches.

1954 Large Scale Clone Trial
Average girth measurements in inches

Clone	Girth Sept. 1956	Girth July 1957	Increase 1956/57
RRIC 31	5.4	8.2	2.8
,, 22	4.6	7.7	2.9
,, 18	4.7	7.2	2.5
,, 34	4.4	6.8	2.4
,, 35	4.8	6.6	1.8
,, 36	4.3	6.6	2.3
RRIM 501	4.0	6.5	2.5
RRIC 24	4.3	6.1	1.8
,, 23	4.4	6.0	1.6
,, 16	4.1	6.0	1.9
,, 28	4.1	5.8	1.7
,, 32	4.1	5.7	1.6
,, 26	4.1	5.7	1.6
,, 21	3.7	5.7	2.0
IRCI 10	3.8	5.7	1.9
RRIC 19	3.8	5.4	1.6
,, 33	3.6	5.2	1.6
,, 17	4.0	5.2	1.2
,, 25	3.5	5.1	1.6
,, 37	3.8	5.1	1.3
,, 29	3.7	4.9	1.2
,, 20	3.2	4.7	1.5
PB 86	3.3	4.7	1.4
AVROS 1301	2.5	4.6	2.1
RRIC 27	3.5	4.4	0.9
PR 107	3.3	4.2	0.9
RRIC 30	2.9	3.5	0.6
Mean	3.9	5.7	1.8

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

Large monoclonal blocks each of twelve RRIC clones were planted in this area during the South-West Monsoon planting period. Each block of 750 trees provides for 3 tapping tasks of each clone.

Girth measurements were taken of every 5th tree in July, 1957, at approximately two years of age. The results given below indicate satisfactory growth of all clones on a somewhat better type of land on our Hedigalla Estate.

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 in inches	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

Clone trials under two years of age are supervised by the Estate Department for general cultural operations and attention to disease control.

1956 Large Scale Clone Trial, 55 Acres, Hedigalla Estate:

In this trial a tapping task of each clone of 300 trees was planted with clone PB 86 as a control. 26 foreign clones introduced to Ceylon on an exchange basis, with 6 local R.R.I.C. clones, were planted on 55 acres. Four clones which are among the best of the foreign "exchange" clones, GT 1, WR 101, AVROS 385 and 427, were planted at Dartonfield Estate in a replanted area. 300 trees of each clone were planted in suitable tapping blocks, as was done on Hedigalla Estate.

1957 Planting Programme:

The decision of the Rubber Research Board on the Director's recommendation to stop further development of the Hedigalla Station (709 acres), because of its unsuitability for critical field experiments, made it necessary to establish, in 1957, clone trials on replantings of collaborating estates pending the development of R.R.I. Sub Stations.

Forty acres on two estates were offered to the Institute for clone trials and the following clones were included in these trials, with 300-tree plots of each clone. The planting was completed in the South-West Monsoon season of 1957.

Estate No. 1, 10 acres.	Clones RRIM 607, IRCI 2 and 3. TR 1406, AVROS 529.
Estate No. 2, 30 acres.	Clones RRIM 602, 603, 612, 622, 623. Clones TR 1542 and 1548. Clones WR 101, PR 248 and 254. Clones AVROS 1734 and 2037. Clones RRIC 60, 61, 75 and 76.

Clone PB 86 was used as controls with 300-tree-plots.

The following planting material was included in field trials in a further block of available planting land on Hedigalla Estate, in the North East Monsoon planting period. Owing to a late monsoon period it was possible to plant up to November, which in normal years is somewhat risky.

1957 North-East Planting, Hedigalla Estate:

Ten-tree-clones from outstanding high yielding hand-pollinated seedlings, tapped for several years, were planted in a section of this area.

(*a*) 169 clones established from 1954/55 H.P. seedlings.

(*b*) 12 clones established from 1955 H.P. seedlings in the 1947 clearing Dartonfield.

(*c*) 15 clones established from 1945 H.P. seedlings in the 1947 clearing Hedigalla.

(*d*) 25 clones established from crosses with the Oidium-resistant clone LCB 870 made in 1951, these will be tested for resistance to Oidium heveae and for high yields.

(*e*) Clone PB 86 was included in 10 tree plots as controls at suitable intervals over the whole area allocated to the testing of the above ten-tree-clones.

The following local and foreign clones completed the planting of the last sections of available planting land on our Hedigalla Estate.

Clone RRIC 51,	250 holes
Clone RRIC 64,	250 ,,
Clone PB 86	200 ,,
Clone CH 26	102 ,,

Hand-Pollination Programme, 1957 Flowering Season:

Although a considerable number of disease-resistant clones has been imported since 1953, this material has not been sufficiently developed yet for the initiation of a breeding programme for the production of clones which are both high yielding and resistant to disease.

In 1957 a pollination programme was carried out to further segregate high yielding characteristics by using the best seed setting high yielding clones as female parents for back crossing, wherever possible with the inclusion of RRIC clones as male parents.

Clone RRIC 52, the most vigorous growing clone in our clone trials, which is late maturing and moderately high yielding, has been used on a considerable scale. It is not normally affected by Oidium heveae due to its partial wintering habits; in this respect it is like clone LCB 1320.

The results of the 1957 hand-pollinations are given, up to germination of seed prior to planting out in nurseries. A number of fungicides has been used with some success for preventing the loss of pods after successful pollination. Each year a considerable number of pods is lost due to Pod-Rot caused by Phytophthora.

Hand-Pollination Programme 1957

Female Parent	Male Parent	No. of pollinations	Early pod-set, No. of pods	% pod-set	No. seed harvested	No. seed germinated
AVROS 163	× *(H.P. seedling No. 1968)	1,499	85	5.6	115	28
,,	× (,, No. 841) *AVROS 163 × Tjir 1	371	9	2.4	29	22
LCB 1320	× PB 86	201	16	7.9	nil	nil
,,	× Tjir 1	529	58	10.9	nil	nil
Mil 3/2	× Mil 3/2	679	2	0.3	3	nil
,,	× Tjir 1	4,752	78	1.6	28	22
PB 5/139	× RRIC 52	3,530	87	4.0	316	112
PB 86	× RRIC 38 (PB 86 × PR 107)	1,348	33	2.4	32	24
,,	× RRIC 36 (,, × ,,)	1,016	41	4.0	42	36
,,	× RRIC 79 (PB 86 × M 162)	130	—	—	nil	nil
,,	× RRIC 52	1,033	4	.3	9	7
RRIC 52	× PB 86	7,344	353	4.8	282	241
,,	× Tjir 1	2,525	133	5.2	67	54
,,	× RRIC 38	877	7	0.8	nil	nil
,,	× PB 5/139	342	35	10.2	6	3
Tjir 1	× RRIC 50 (Tjir 1 × PB 86)	2,511	146	5.8	148	142
Wag 6278	× Tjir 1	389	44	11.3	42	4
,,	× RRIC 54 (PB 86 × Wag 6278)	749	17	2.2	18	nil
Total		29,825	1,148	3.8	1,137	695 (61.1%)

*High yielding H.P. Seedling of AVROS 163 × Tjir 1 crosses.

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

Test tapping of the above material has been continued. Most of the clones have been recommended for commercial planting on a large or small scale. The results, which are presented in Tables XIII to XVIII, enable us to keep the rubber growers informed of the performance of these clones in the later years of tapping.

Nab Clones:

Four Nab clones from the original 21 clones established from Tjikadoe seedlings on Nabunnatenne Estate have been test tapped in 1957. The results are presented in Table XIII from 1954 to 1957.

TABLE XIII

1939 Clearing, Nivitigalakele
Trees first tapped in 1945
Tapping System S/2, d/2, 100%

Clone	No. of trees tapped 1957	Yield in lb. d.r. per tree per year.				B.B. cases	Bark-Rot and Canker cases	Wind-damage cases
		1954	1955	1956	1957			
Nab 12	18	18.0	20.8	15.9	18.3	5	—	1
Nab 15	17-18	16.5	14.3	15.7	15.0	4	1	—
Nab 17	12-13	17.1	16.2	16.7	17.4	10	—	2
Nab 20	12-13	16.3	18.9	16.2	15.3	7	—	7
Control PB 86	12-13	18.3	19.6	17.3	20.9	4	—	—

TABLE XIV

Clone Trial, 1940 Clearing, Nivitigalakele
Tapped S/2, d/2, 100% from January, 1947

Clone	No. of trees tapped 1957	Yield in lb. d.r. per tree per year.				B.B. cases	Bark-Rot and Canker cases	Wind-damage cases
		1954	1955	1956	1957			
RRIM 501	16-17	15.6	17.3	12.6	12.5	8	—	6
PB 6/50	21	13.8	15.1	16.0	18.5	6	1	2
AVROS 352	12-10	18.0	14.7	13.7	11.6	13	2	6
PR 107	21-20	14.1	14.3	14.3	12.6	4	7	2
RRIM 513	22	11.1	14.3	10.6	12.1	4	—	—
AVROS 255	16	19.8	13.8	19.4	15.1	8	—	6
War 4	23-22	12.1	13.3	14.9	16.0	4	2	—
RRIC 1	22-21	13.9	12.1	13.4	13.8	4	—	—
Lun N	18-19	13.4	11.0	13.5	11.7	5	1	2
Control Tjir 1	20	13.0	12.2	16.1	14.0	8	—	2

TABLE XV

Large Scale Clone Trial, 1946 Clearing, 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 5/60	LCB 1320	CHM 3	Tjir 1	PR 107
No. of trees tapped. Yield 1955	279-270	240-236	299-289	303-297	292-290	276-257	249-246	299-278
	8.9	6.5	10.7	7.6	8.2	7.6	6.2	7.3
„ 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
B.B. Cases	15	4	25	13	9	11	11	4
Canker cases	2	5	4	1	—	1	—	—
Wind Damage cases	37	65	10	14	21	49	39	9

TABLE XVI

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

Clone	No. of trees tapped 1957	Yield				B.B. cases	Canker cases	Wind-damage cases
		1954	1955	1956	1957			
RRIC 52	4	13.1	12.7	17.7*	23.9	—	—	1
PB 5/122	5	14.9	13.8	18.7	21.7	—	1	—
PB 6/5	4	13.1	13.1	18.0	21.6	—	—	1
RR 25	4	13.9	16.9	19.8	20.3	—	—	1
Wag 6278	5	11.8	9.4	11.8	13.5	—	—	—

*Tapped from January to June 1956.

This area is test tapped for the yields of clone RRIC 52, which is a shade loving clone with thick bark and vigorous growth. A moderately high yielding clone in the early years of tapping, is now yielding 23.9 lb. dry rubber, per tree, per year in the 6th year of tapping. The trees are the largest budded trees for their age among the clones tested at the R.R.I.C. In the 1949 clearing clone RRIC 52 has given 3.3 lb. d.r. per tree, per year for the first year of tapping compared with clone PB 86 which yielded 5.5 lbs. 136 trees of each clone are tapped on S/2, d/3, 67 per cent. The yield of clone RRIC 52 is quite satisfactory for the first year on the reduced intensity of tapping. It can be expected to give better yields when the trees are tapped at 100 per cent intensity.

RRIC clones 2 to 7:

The above clones were established from 120 three-tree-clones established from PBIG seedlings imported in 1934. In a second trial of these clones, 75 trees of each clone in 25 tree plots are tapped in the 1945 clearing at Hedigalla. The results are presented in Table XVII.

The clones are planted in a very poor area on Hedigalla, with little of the sun in a sheltered valley. With the heavy annual rainfall of 150 to 200 inches this area has a fair number of cases of bark disease.

TABLE XVII

Results of clones RRIC 2 to 7 established from PBIG seedlings, 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
Yield 1956	11.1	8.5	10.4	13.1	12.1	13.9	11.0
,, 1957	10.4	8.1	10.6	12.5	12.5	13.1	11.3
Canker cases	3	2	1	1	8	—	3

Chemara Clones:

A small-scale trial of these clones was carried out as soon as the budwood was received in August, 1950. The trees were brought into tapping in March, 1957. The yields of the Chemara clones for the first 10 months' tapping is given in Table XVIII.

TABLE XVIII

Trial of 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	PB 86	LCB 870
No. of trees tapped	36	52	27	20	65	45	30	57	53	58
Yield	3.1	4.2	2.9	3.2	8.1	4.4	4.1	4.8	6.5	2.6

The yield of clone Chemara 26 is outstanding and is decidedly better than that of clone PB 86 under the conditions of this trial. The low yielding qualities of the Oidium-resistant clone LCB 870 is once again clearly indicated, apart from the undesirable characteristic of extremely thin bark indicated in earlier investigations.

Crown Budding Investigations:

Our experience of crown-budding in the field has indicated that it is extremely doubtful that the field procedure can be adopted as a practical proposition on most commercial plantations, especially of the middle and smallholdings type. Until such times as when high yielding clones, resistant to diseases caused by Oidium heveae and Phytophthora, are evolved by breeding and selection work, it will be necessary to control these diseases by dusting with the effective fungicides in areas planted with the present high yielding clones which are susceptible to one or more diseases. Co-operative dusting has been successfully adopted by smallholders in recent years.

The present investigations are being continued on crown-budding, for preliminary information on the effect of crowns on budded centre sections and clonal seedlings, in case some improved methods of establishing crown-budded trees in field are evolved in the future.

Effects of Crown-Budding on the Growth of Centre-Sections:

In a large scale clone trial planted in 1952 on 35 acres at Dartonfield, one half of 200 tree plots each of five clones replicated fourfold was crown-budded with clone LCB 870, which is resistant to Oidium. Although this clone is susceptible to Phytophthora diseases, it can be useful as a crown in newly planted areas at high elevations with limited rainfall.

The results of girth measurements, taken of every 5th tree over 35 acres, indicate that the crown-budded trees are one year behind in growth up to tapping age, when the control trees not crown budded can be taken into tapping one year earlier than crown-budded trees.

Crown Budding Trial, 1952 Clearing, Dartonfield
Average girth measurements in inches

Clones	Not crown budded (Control)			Crown Budded		
	1956	1957	Increase 1956/57	1956	1957	Increase 1956/57
PB 86	13.3	16.4	3.1	10.1	13.7	3.6
RRIM 501	14.8	18.0	3.2	10.2	14.2	4.0
Nab 12	13.8	17.5	3.7	10.0	13.7	3.7
Nab 15	16.8	21.2	4.4	11.5	16.0	4.5
Nab 20	14.4	19.0	4.6	9.8	13.8	4.0
Mean	14.6	18.4	3.8	10.3	14.3	4.0

Summary of Growth Figures from Data of Crown-Budding Experiment with Clone LCB 870
Girth in inches.

	Trees not crown-budded	Crown-budded	Girth difference
Prior to crown-budding at end of the second year of growth ...	6.4	6.3	0.1
August, 1955 ...	10.9	7.6	3.3
August, 1956 ...	14.6	10.3	4.3
August, 1957 ...	18.4	14.3	4.1

The crown budded trees are still a year behind in growth in 1957. The growth rate of crown budded trees is now up to the standard of control trees.

The growth of the Nab clones, together with clone RRIM 501, is outstanding in their 5th year of growth.

Effects of Crown Budding on Yield:

In general clones, which are discovered in the first instance as disease resistant, are hardy and low yielding. The effect of crown budding high yielding clones with low yielding resistant crowns is most important. In 1948 twin seedling pairs of about 2 years of age were crown budded with clone LCB 870 (Oidium-resistant) and high yielding clone Tjir 1 (Oidium-susceptible).

The results of 1957 test tapping of the twin pairs of seedlings are presented below for various types of clonal seedlings and various heights of crown-budding. The results will be reviewed in a later report, when the figures have been statistically analysed.

1948 Twin Seedling Area, Hedigalla
Tapped S/2, d/3, 67%
Yield in grams per tree, per tapping, 1957

Clonal Seedlings	No. of pairs tapped	Crowns	
		Tjir 1	LCB 870
Tjir 1	37	25	23
PB 86	38	27	23
Glen 1	22	24	21
Mil 3/2	45	28	25
Unselected	27	15	17
Total	169	Mean 24	22

The twin seedlings before crown budding were approximately equivalent in girth measurements. There are indications that the yields of crown-budded seedlings may have been improved with the crowns of the high yielding clone Tjir 1 as compared with clone LCB 870 crowns.

Differences in Yield according to heights of crown budding
Yield in grams per tree, per tapping

Height of crown budding	No. of pairs tapped	Crowns	
		Tjir 1	LCB 870
4 feet	20	22	20
5 feet	30	22	21
6 feet	21	21	21
7 feet	12	25	24
8 feet	86	27	23

In the case of clonal seedlings the height of budding with a high yielding crown has given differences in yield which are problematical. The height of tapping cuts are the same on all trees.

It is possible that the experimental error is of a high order and the differences are not significant. The figures will be statistically analysed for a later report.

Large Scale Crown Budding Experiments 1945 Clearing, 11¾ Acres, Hedigalla:

Three high-yielding clones, PB 86, Tjir 1, and Glen 1, and three low-yielding clones, AVROS 256, PM 17 and Rub 393, are used both as budded centre-sections and crowns in a balanced layout. The yield results for 1957 are summarized in Table XIX. The controls for comparisons are printed in bold type.

TABLE XIX

Crown Budding Experiment, 1945 Clearing, Hedigalla
Tapped S/2, d/3, 67% from 1955
Yield in grams d.r. per tree per tapping

Budded centre sections	Height of budding	CROWNS						
		Tjir 1	AVROS 256	PB 86	PM 17	Glen 1	Rub 393	Means
Tjir 1	5 ft	**28.2**	26.5	35.3	17.8	25.0	24.1	26.2
	8 ft	**28.8**	27.0	35.6	17.9	30.7	22.5	27.1
AVROS 256	5 ft	23.2	**14.6**	21.6	15.4	20.2	18.6	18.9
	8 ft	21.5	**15.8**	23.1	15.9	18.6	18.4	18.9
PB 86	5 ft	34.3	32.9	**39.6**	26.9	25.5	26.8	31.0
	8 ft	34.6	32.6	**39.4**	25.0	32.6	25.6	31.6
PM 17	5 ft	29.9	28.0	47.2	**23.1**	24.9	26.9	30.0
	8 ft	30.7	26.3	43.2	**24.3**	29.0	24.7	29.7
Glen 1	5 ft	35.0	33.5	39.5	21.4	**34.1**	31.2	32.4
	8 ft	27.3	32.7	36.2	19.5	**35.0**	36.7	31.2
Rub 393	5 ft	25.7	28.7	34.4	18.4	22.1	**24.4**	25.6
	8 ft	27.6	30.3	27.8	20.5	24.0	**24.5**	25.8
Mean	5 ft	29.4	27.4	36.3	20.5	25.3	25.3	**27.4**
	8 ft	28.4	27.4	34.2	20.5	28.3	25.4	**27.4**
General Mean		28.9	27.4	35.2	20.5	26.8	25.3	27.4

The results of three replications of the above layout indicate that, in the case of budded rubber, there is no difference in yields for crown-budding at heights of 5′ and 8′ from ground level.

Clone PB 86, the best yielding clone used as a crown, has improved the yields of the budded centre-sections of all other clones. No other clones used in this experiment have increased the yields of clone PB 86 with its own crown. Most high yielding clones used as crowns have improved the yields of the budded centre-sections of low yielding clones.

MISCELLANEOUS EXPERIMENTS

Systems of Planting:

Large Scale Clone Trial, Planted 6′ × 45′, 1949 Clearing, 35 Acres, Hedigalla.—Test tapping was continued in this area in 1957 of a selection of clones, which were promising in the first year of tapping. Each clone has 6 plots of 25 trees each. There are 31 clones in this area.

It is interesting to note that some of the better known clones, including clone PB 86, have given yields well up to expected standards, or even better, on this wide avenue system of planting. After 3½ years of growth, the shape of the crown of most clones is conical and it will be some time before the crowns meet between the planting rows to form a continuous flat foliage surface to the sunlight. The claim that in wide avenue planting a greater foliage surface is presented to the sunlight, as compared with square planting, is, therefore, very evident in the early years of growth.

The stand per acre has been reduced to about 150 trees, per acre in 1957. It is hoped that by the 4th year of tapping, the stand per acre will be reduced to a permanent stand of 130 trees per acre, by uprooting the poorest yielding trees.

There has been no wind damage of any significance on any one of the 31 clones in this area.

The yield results for 1957 are presented in Table XX. As stated in the previous years clone RRIC 52, which is a late maturing clone, is better adapted to a 100 per cent intensity tapping and depends for its high yields on the length of cut. It is the most vigorous growing clone we have at the present time.

The Nab clones have done quite well, but the final selections of the best Nab clones No. 12 and 15 were not planted in this area.

TABLE XX

Large Scale 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	B.B. cases	Canker cases	Wind damage cases
PB 86	128-136	5.5	—	—	—
Nab 17	127-154	5.3	—	4	—
PB 6/50	150	5.2	3	7	1
RRIM 513	117-134	5.2	—	—	—
RRIM 501	104-124	4.8	—	1	—
Nab 16	73-102	4.8	—	—	—
Nab 20	134-138	4.7	1	1	—
No. 30	120-138	4.7	2	—	—
No. 19	74-86	4.2	—	—	—
No. 49	124-130	4.2	—	—	—
No. 44	102-114	4.1	—	—	—
RRIM 504	104-113	4.0	—	—	—
No. 29	123-133	3.8	—	—	—
No. 50	60-75	3.6	—	—	—
Lun N	96-110	3.5	—	2	—
No. 32	68-90	3.5	—	—	—
No. 48	118-128	3.5	1	—	1
RRIC 52	135-136	3.3	—	—	—
No. 46	116-128	3.1	—	—	—
No. 34	87-101	3.0	—	—	1
Dar. 38	115-124	3.0	—	1	1
No. 31	129-135	3.0	—	1	—

Clonal Seedling Trial, 1947 Replanted Area, Dartonfield:

The test tapping of 4 "types" of clonal seedlings was continued in 1957.

The original stand per acre was 260 trees per acre. In 1951 the stand per acre was reduced to 160 trees per acre on the results of early tapping on the Morris-Mann System. In 1957 the stand was further reduced to 140 trees per acre. The results are presented below:—

Clonal Seedling Trial

Tapped S/2, d/2, 100% from 1955

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

Planting Material	Tjir 1 seedlings	PB 86 illeg. seedlings	PB 5/139 seedlings	H.P. seedlings	Budded Tjir 1 control
1955	8.2	6.2	8.4	10.1	8.0
1956	7.4	6.2	7.6	9.1	8.0
1957	6.9	6.6	6.7	7.3	7.5

Tapping of clone LCB 870 on Glendon Group:

The test tapping of the Oidium-resistant clone on the above estate again confirms the poor yielding qualities of this clone. The clone is also a thin bark type, with a bark thickness of 5.5 to 6 mms. The results are summarised below:

	1956	1957
Total number of trees tapped	67	67
Total number of tappings	716	636
Total yield of dry rubber in grams ...	4082.9	5554.1
Yield in lb. d.r. per year	1.8	2.7

This clone is now definitely not recommended for direct planting on commercial estates. Owing to practical difficulties of crown-budding with clone LCB 870 against the incidence of Oidium, crown budding has been made optional at high elevations. Co-operative sulphur dusting against the leaf disease has been successfully adopted among middle class and smallholders.

The earliest first generation crosses of clone LCB 870 with high yielding clones have been test tapped on the ten day (Morris-Mann) system and 25 high-yielding seedling trees have been selected for establishing 10 tree clones, which were planted in 1957. This material will be tested finally for yields and resistance to Oidium. The 25 seedling trees will also be used for back-crosses in 1958.

Budwood Distribution:

Apart from the R.R.I.C. and Nab clones, which have already been distributed to local estates, we will be in a position to distribute small quantities of budwood of the "exchange" clones which have been introduced into our nurseries from Malaya, Java, Sumatra and Indonesia. The following clones will be a suitable collection for polyclone trials on commercial estates. A number of these clones have been recommended in their countries of origin for large scale commercial planting.

RRIM 603, 605, 607, 610, 612, 622, 623.

IRCI 2, 5, 6, 7 and 10.

GT 1, WR 101, PR 247, 228, 257, 258, 253, 254.

AVROS 385, 427, 1851, 529, 1191, 1328, 1447, 1734.

A circular will be issued in 1958 on the foreign "exchange" clones which have been established in our budwood nurseries.

REPORT OF THE PLANT PATHOLOGY DEPARTMENT

By

Alfred Riggenbach

SUMMARY

General:

The volume of the correspondence of the department has further increased. The number of visits carried out during 1957 by the Plant Pathologist and Assistant Plant Pathologist for advisory and experimental purposes showed a three fold increase when compared with the corresponding figures for 1956.

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

Oidium heveae:

The incidence of Oidium during the 1957 season was in most districts mild. When towards the end of season the weather conditions turned wet, some areas experienced heavier attacks of the disease.

The disease, however, could be kept well under control by routine sulphur dusting.

The department continued the series of experiments comparing the effectiveness of Karathane and Sulphur during the Oidium season 1957. In a further experiment the effectiveness of the normal rate of sulphur dust at 12 lbs./ac., per round was compared with that of a reduced rate of 6 lbs./acre per round.

Phytophthora palmivora:

The incidence of the leaf disease caused by Phytophthora palmivora was very heavy, especially in the more humid planting districts. The disease broke out only at the beginning of July, with the onset of a second wave of the S.W. Monsoon. 16 experiments were carried out with different fungicides.

The experiments covered a total area of 359 acres, distributed over 9 estates in different districts.

Products belonging to three different groups of fungicides *i.e.* copper-based, organo-metallic and organic were tested.

The copper-based fungicides proved to be the most effective and also the most economic.

The Phytophthora leaf disease can be effectively checked by dusting with a suitable copper-based dust at appropriate rates and intervals, but as

copper-based dusts may contaminate rubber (especially the scrap rubber) certain precautions have to be taken.

Some organo-metallic and organic fungicides gave fairly promising results. These fungicides are, however, more expensive than copper-based fungicides and furthermore they all may have (to a greater or lesser extent) effects on manufactured rubber, if the latex is contaminated.

Some new fungicides against the Phytophthora bark disease, the black stripe and the canker disease were tested in the field and in the laboratory and encouraging results have been obtained.

Root Diseases:

The problem of the control of Fomes lignosus has been intensively and successfully pursued.

Field Experiments:

The long term field experiments in connection with the breeding of resistant clones and with crown budding were supervised and given the necessary attention.

DETAILED REPORT

I. GENERAL.

A. Staff.—The Plant Pathologist and the Assistant Plant Pathologist, Mr. O. S. Peries, were on duty throughout the year.

Mr. H. L. Munasinghe, Technical Assistant, returned on the 7th May, 1957, from a one year training course under the Colombo Plan at the Waite Agricultural Research Institute, Adelaide, Australia.

We would like to record our thanks to the authorities concerned for granting this scholarship to Mr. Munasinghe and, especially, to the Waite Agricultural Research Institute for undertaking the training course.

Mr. Munasinghe was appointed Senior Technical Assistant with effect from 1st September, 1957.

Mr. E. G. Mendis and Mr. T. M. Fernando, Technical Assistants, were on duty throughout the year.

Mr. L. T. Jayaweera was appointed Technical Assistant and assumed duties on 2nd February, 1957.

B. Correspondence.—The correspondence has increased during 1957. The figures for 1956 and 1957 are as follows:—

Correspondence	...	1956	1957
Incoming letters	...	972	1,153
Outgoing letters	...	1,132	1,384

These figures include both the advisory and the general correspondence.

C. Visits.—Both the number of the advisory visits and the number of visits in connection with R.R.I.C. experiments have considerably increased.

The figures for 1956 and 1957 are as follows:—

Visits carried out	Advisory		In connection with RRIC experiments	
	1956	1957	1956	1957
Plant Pathologist	27	18	16	51
Assistant Plant Pathologist	39	76	—	93
Total	66	94	16	144

The Plant Pathologist and the Assistant Plant Pathologist paid altogether 238 (1956: 82) visits to different estates. 94 (1956: 66) of these visits were concerned with problems of disease on estates and smallholdings. A report on each visit, giving our observations and recommendations, was sent to the estates or agencies concerned.

144 (1956: 16) visits were carried out in connection with experiments.

In November, 1957, the Plant Pathologist visited some rubber estates in South India where large scale Phytophthora experiments had been carried out. A report on this visit has been submitted.

D. Visitors.—The Department received during 1957 a number of visitors. The 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 lignosus, a Pyrimidine-deficient fungus" written by the Plant Pathologist, appeared in Nature, Vol. 180, No. 4575 dated 6-7-1957.

A stencilled Advisory Leaflet on Phytophthora disease was issued.

II. LABORATORIES AND FIELD WORK.

A. Diseased Specimens.—The examination of diseased specimens in the laboratory included in most cases the growth of the causal fungi in culture for final diagnosis of the disease.

Altogether 72 (1956: 88) specimens were brought or sent to the Plant Pathology Department for examination and report. On these 72 specimens 18 different types of diseases and pests or other causes of damage could be distinguished. They are listed in the following table:

Hosts and Nature of Diseases, Pests or Damages	No. of cases
1. Diseases, pests and damages of Hevea brasiliensis caused by:	
a. **Fungi or bacteria:**	
Botryodiplodia theobromae	4
Fomes (Leptoporus) lignosus	13
Fomes noxius	4
Gloeosporium alborubrum	3
Helminthosporium heveae	2
Hypocrella reineckiana	1
Oidium heveae	13
Phytophthora palmivora	11
Ustulina zonata	1
b. **Pests and other causes:**	
Mites and various Insects	7
Scale Insects	3
Lightning Damage	3
Sun damage	2
Water damage	1
Wind damage	3
Other causes	15
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 in 1957 was generally mild. During the first part of the wintering and refoliation period the weather was fairly dry and therefore unfavourable for the development of the disease. When, however, towards the end of the season the weather turned wet, a few late-wintering areas experienced heavier attacks of Oidium. The disease was especially prevalent in those areas which were only dusted at a reduced rate of 8 lbs. of sulphur dust per acre, per round instead of the full normal dose of 12 lbs. The control of the Oidium disease by sulphur dusting was most satisfactory.

2. Field Experiments.

The Department carried out two field experiments during the Oidium season. One experiment continued the series of experiments started in 1956 to compare Karathane dust with Sulphur dust. The other experiment compared the effectiveness of dusting at the normal rate of 12 lbs. of sulphur per acre, per round with that of dusting at a reduced rate of 6 lbs. per acre, per round.

a. Karathane v. Sulphur experiment.

General.

This experiment was carried out on St. George and Mirishena Estates. On both estates single areas of 27 acres planted with a single clone known to be

susceptible to Oidium were chosen. On Mirishena Estate the experiment was carried out in an area of clone BD 5 and on St. George Estate in an area of clone Tjir 1.

Treatments.—

1. Dusting once per week with Karathane dust containing 1 per cent of the active material, Dinitro-capryl-phenol-crotonate, at the rate of 24 lbs. per acre, per round (7 rounds).
2. Dusting once per week with Sulphur dust at 12 lbs. per acre, per round (7 rounds).
3. Dusting twice per week with Sulphur dust at 12 lbs. per acre, per round (14 rounds).

Results.—The effect of the treatment was assessed by leaf counts. Leaf counting was carried out in marked leaf counting plots of 10′ × 5′. There were 2 such plots per acre.

It was found that Karathane dust, containing 1 per cent of active material, dusted at the rate of 24 lbs. per acre per round once per week, takes an intermediate place between sulphur dusting at the rate of 12 lbs. per acre per round once per week, and sulphur dusting at 12 lbs. per acre, per round twice per week. The most effective treatment was sulphur dusting at of 12 lbs. per acre, per round twice a week.

b. 6 lbs. of Sulphur per acre, per round v. 12 lbs. of Sulphur per acre, per round:

General.—This experiment was carried out at Dartonfield in the 7½ acre field on clones Glen 1 and PB 25.

Treatments.—

1. Dusting once per week with Sulphur dust at 12 lbs. per acre, per round.
2. Dusting once per week with Sulphur dust at 6 lbs. per acre, per round.

Results.—The results were assessed by leaf counting in marked leaf counting plots measuring 10′ × 5′.

The leaf counting showed that the leaf fall was more than twice as high in the blocks dusted at the rate of 6 lbs. per acre, per round than in the blocks dusted at the normal rate of 12 lbs. per acre, per round, although weather conditions were not particularly favourable for the disease.

If in a wet season dusting is carried out at such a reduced rate the control of Oidium could well get out of hand.

C. Phytophthora palmivora.

Phytophthora leaf disease.

1. Laboratory Experiments.

Experiments were carried out with three different chemicals for destroying the rubber flowers. Of these three chemicals tested, only one showed some effects.

The substance however destroyed, if applied in excessive concentrations, not only the flowers but also the young leaves and shoots.

2. Field Experiments.

16 experiments for indirect and direct control of the Phytophthora disease were carried out.

The experiments were distributed over 9 estates in different districts and covered a total area of 359 acres.

Indirect control:

One experiment for the indirect control of Phytophthora was carried out at Ellakande Estate.

In this experiment an attempt was made to obtain a reduction of the pod-set by destroying the pollinating insects during the flowering season. As the flowering season coincides with the Oidium season, the insecticide was mixed with the normal sulphur dust. The dusted mixture contained 4 per cent active insecticide (gamma benzene hexachloride).

The experiment was, however, unsuccessful as no reduction in the pod-set was obtained.

Also from the standpoint of biological balance this method might be objected to. Indiscriminate large scale destruction of insects could lead to undesirable results.

Direct control:

General.

The fungicides used in these fifteen experiments can be grouped as follows:

(*a*) Copper-based fungicides. These contain as active material copper in the form of either cuprous oxide or copper oxychloride. (4—6% Cu.)

(*b*) Organo-metallic fungicides. These contain as active material organo-metallic compounds such as carbamates based on zinc. (*e.g.* zinc ethylenebisdithiocarbamate).

(*c*) Organic fungicides. These fungicides contain as active material purely organic compounds such as preparations based on thiuram (tetramethyl thiuram disulphide) and phthalic anhydride (N-trichloromethyl-thiotetra-hydrophthalimide).

The organo-metallic and organic fungicides were included in the experiments to find, if possible, cheap and effective materials which would not have the same unfavourable effects on rubber as may be caused by copper-based fungicides. Unfortunately, however, the organo-metallic and organic fungicides are more expensive than copper-based fungicides and furthermore they too may have (to a greater or lesser extent) undesirable effects on manufactured rubber. Some dithiocarbamates are accelerators in the rubber vulcanising process.

Results:

Copper-based fungicides:

The most effective fungicides proved to be the copper-based products. No difference could be observed between copper oxide and copper oxychloride preparations. There was also no marked difference between different commercial brands of copper-based fungicides.

The dusts containing 4 or 6 per cent copper proved to be suitable if dusted at the proper rate of application. There was, however, no marked difference between the dusts (without stickers) containing 4 and 6 per cent copper. Of the dusts with still lower copper content, 1 per cent and 0.1 per cent, only Ciba 1 per cent which has also a special sticker incorporated, was as effective as an ordinary 4 per cent dust. The experiments further showed that the best results are obtained with dusts ground to such a fineness that at least 93-95 per cent of the powder could be sieved either through a 300 mesh standard sieve of the British Standard Institution or a 325 mesh standard sieve of the American Society for Testing Materials. Filler and copper compounds should not separate when the dusts are sieved.

A rate of application of 8-10 lbs. per acre and round, with dusting rounds spaced at about 5 day intervals, appears to give best results.

Organo-metallic fungicides:

These fungicides showed quite promising results, which must however be confirmed in further experiments.

Organic fungicides:

Phthalic anhydride preparations:

Two dusting preparations, containing 0.8 per cent and 2 per cent active material (N-trichloromethyl-thiotetra-hydrophta-limide), were quite ineffective.

Thiuram preparations:

Two dusts, containing 1 per cent and 4 per cent active material (Tetramethyl-thiuramdisulphide) were tested.

The dust containing 4 per cent active material gave satisfactory results.

Phytophthora bark disease.

The black stripe disease or bark rot and its later stage the bark canker, caused by Phytophthora palmivora, have become in certain districts more and more important causing considerable damage, especially in high yielding new stands.

a. Black stripe disease.

Experiments were carried out in the laboratory and in the field with different new water-miscible fungicides such as Antimucin, Anti-Phy and Fylomac 90.

In the recommended concentrations none of these fungicides showed any phytotoxic effects. In laboratory and field tests Antimucin was found to be

by far the most effective fungicide against Phytophthora palmivora on tapping panels and canker patches. The active ingredient of Antimucin is incorporated in the product as a water-soluble, cellulose-fixing complex which prevents it from being washed off by rain to a considerable extent.

b. Bark Canker.

Field experiments were carried out with Kankerdood, a waterproof fungicide especially suited for the healing of old canker patches.

Kankerdood proved to be most effective for this purpose and wounds treated with this fungicide callused over perfectly.

Kankerdood being a paint-like product is very persistent and practically not washed off by rain. Furthermore and contrary to grease based waterproof products Kankerdood does not seal of the protected bark so hermetically as to prevent the normal function of the underlying tissues.

Some of these fungicides tested under (a) and (b), especially Kankerdood, are poisonous and must be handled carefully. The Plant Pathology Department must therefore disclaim responsibility for accidents or damage that may result from the use of any fungicide.

D. Root Diseases.

A number of different chemicals were tested in the laboratory in regard to their suitability as fungicides for the control of Fomes lignosus.

Of all the chemicals tested to date, Tillex Liquid showed the most promising results. This fungicide was the most effective of all chemicals tested, much more effective than either copper sulphate or dithiocarbamates.

Field trials have shown that Tillex Liquid has an excellent curative effect, 90—95% of the treated trees being saved. To test this fungicide also as a preventive, a 10-acre field experiment was started in a wet Deniya land at Nakiadeniya Estate, replanted after removal of an old stand heavily infected with Fomes lignosus.

E. Field Experiments.

1. **Dartonfield 2 ac. 1952 replanted area**

Breeding for Oidium Resistance with clone LCB 870.

This experiment was closed down. The Botanist in collaboration with the Plant Pathologist selected 25 seedlings out of a total of about 850 plants. These were established as 10-tree-clones in Hedigalla.

2. **Dartonfield 1 ac. 1953 replanted area**

Oidium Research Experiment.

This area is planted with local and foreign clones for testing Oidium resistance. Other small field trials are also carried out in this block.

3. **Hedigalla ½ ac. 1954 clearing**

Hand-Pollinated Seedling trial.

In 1954, 251 hand-pollinated seedlings from the 1952 hand-pollinating programme, consisting of crosses of the Oidium-resistant clone LCB 870 and high yielding clones were planted out as stumped seedlings.

Routine attention was given to this experiment.

4. **Hedigalla 5 ac. 1954 clearing**

Hand-Pollination Experiment 1953 with Clone LCB 870.

652 hand-pollinated seedlings of the pollination programme 1953 were planted in this area in 1954.

Routine attention was given to this experiment.

5. **Hedigalla 26.5 ac. 1954 clearing**

Oidium Resistance Experiment.

Routine attention was given to this experiment.

6. **Hedigalla 7 ac. 1954 clearing**

Oidium Resistance Experiment.

In this area were planted in 1955:

Clone LCB 870 crosses with high yielding clones	872 seedlings
Illegitimate seedlings of clone LCB 870	23 ,,
5-tree-clones from LCB 870 crossed seedlings	155 budgrafts

Routine attention was given to this experiment.

REPORT OF THE AGRONOMY DEPARTMENT

By

D. H. Constable

SUMMARY

The department has been at full strength almost the whole year up to the Agronomist's departure on end-of-contract leave on December 16th, prior to his resignation.

Much of the time available has been taken up with the training of new intakes (three Technical Assistants out of the four posts established).

Further data have been obtained in respect of foliar Zinc and do not suggest that this is a primary cause of the severity of Oidium in Ceylon. It is also quite clear that it does not account for inter-clonal differences.

The year's programme of visits has been unusually heavy. This is due mainly to reconnaissance visits for new manurial experiment sites.

We were fortunate enough to entertain Professor F. Hardy, C.B.E., M.A., for a week during which we toured much of the rubber growing areas and had a thorough discussion on the soil types and characteristics.

The latest communication from Malaya has confirmed our previous note. Over much of their soils a clear indication that Nitrogen alone is of little value and that the addition of Potassium causes significant and useful improvement in both girth and yield has been obtained. We are obtaining similar results in approximately 50% of our field experiments. We believe that the exceptions are connected with the outcrops of mica which occur at intervals, particularly down the quartzite band.

The weedkilling investigation has been brought to a close and recommendations issued. Three mixtures, one an original discovery by this department, have been found between them to kill grass, etc. in all clearings tested. The choice of the most suitable mixture for prevailing species and conditions is left to the Superintendent concerned.

Latex stimulation work is proceeding on budded rubber. Considerable increases in gross yield have been obtained but in view of the natural liability of Ceylon rubber to Bark Rot care must be taken to see that applications are not so heavy as to cause bark cracking.

A new greenhouse has been built and cover crop work is now proceeding more rapidly. The design of the greenhouse appears to be quite satisfactory and excessive temperatures have not been recorded to date.

DETAILED REPORT

Staff

The Agronomist's contract terms were altered by mutual agreement and he proceeded on four months end-of-contract leave with effect from 16th December, 1957, prior to his resignation.

Mr. A. J. Jeevaratnam (Research Assistant) was appointed to the vacant post of Assistant Agronomist with effect from 1st June.

Mr. T. Kanthasamy, late of the Maha Illupalama Research Station, was appointed Senior Technical Assistant on probation with effect from 2-1-57.

Mr. E. R. Chelliah, late of the Coconut Research Institute, was appointed Technical Assistant on probation with effect from 1-2-57.

Mr. U. K. D. Lewis, late of the Latex Corporation, was appointed Technical Assistant on probation with effect from 2-1-57.

Mr. G. D. Francis, late of the Gal Oya Development Board, was appointed Field Assistant on probation with effect from 2-1-57 and resigned his post in the R.R.I. of Ceylon with effect from 29-5-57.

Mr. M. Goonewardane was appointed Field Assistant on probation with effect from 15th July, 1957.

Apart from normal periods of leave, sickness, etc. all other members of this staff were on duty for the whole year and all established posts were filled.

Laboratory Work :

Laboratory work this year has been quite largely concerned with the training of new staff, Mr. A. K. Gunadasa being the only Technical Assistant familiar with the laboratory work.

Soil analysis has played a larger part in our work and over 200 soil samples have been examined wholly or partially for pH, mechanical composition, N, P&K, exchange capacity and saturation.

In leaf analysis further tests on leaf zinc contents were carried out during the Oidium season and results are reported in Table I. These results are more variable due to the analyses being done on immature leaf at about its period of maximum susceptibility. From these results and those of 1956 it still does not seem likely that zinc deficiency is a major factor in our Oidium problem and most unlikely that it accounts for the relative susceptibility of clone Tjir 1.

Only one major case of deficiency symptoms has been reported and the leaf analyses are given in Table II.

This case showed all-over yellowing on the youngest leaves and root damage by grubs was suspected. This was shown not to be the case; so leaf spraying was undertaken as well as applications of readily available nutrients to the soil. Results were inconclusive and after consultation with other departments it was put down as a physiological disorder triggered off by heavy manurial applications shortly before the worst drought in the records of the district.

Investigations on Nitrogen fractions in the leaf and stalk have been continued. Examination of total Nitrogen, acetic acid soluble N, ammoniacal N and Nitrate N has been made but, as the field experiments chosen for the samples have not shown as clear Nitrogen growth effects as are necessary for the purpose of this investigation, detailed analytical results are not given in this report. Further attempts will be made when the greenhouse is brought into full scale operation.

The present situation regarding foliar diagnosis is reasonably satisfactory. For N, K, Mg & Ca we can define sufficiency levels, deficiency levels and an in between indeterminate region of values for leaf analysis. From our work on total uptake we can define the actual and desirable contents of the various nutrients according to the tree growth and, given cause for suspicion of a deficiency in any nutrient mentioned, we can define a reasonable level of nutrient required to restore the proper nutritional balance. Our work on satisfactory trace element levels confirms that of Bolle-Jones in Malaya and we should be in a position to diagnose trace element deficiencies should they arise.

We are left therefore with Phosphate for which we have deficiency values but nothing else. This is probably due to relatively heavy overall applications of rock phosphate annually over the past 15 years and in planting holes of new clearings, the result of which is a good soil phosphate status. Fortunately rock phosphate is relatively inexpensive so the necessity to define an exact phosphate nutritional status is not very great. Probably pot tests using quartz sand as the growing medium will be the best material for plotting the nutrition/concentration relationship.

Since Nitrogen is both the most expensive nutrient and the most likely to be in short supply further studies should be aimed at seeking means of identifying intermediate levels of Nitrogen nutrition. This will probably come through a study of the Nitrogen fractions.

Studies have also been made on nutrient contents of official and unofficial cover crops. An important discovery is the high K content of Mikania scandens of 1.6 per cent (oven dry basis of total tissue) as compared with 0.3 per cent average for Desmodium Pueraria or Centrosema.

In connection with the soil survey 210 samples have been analysed for pH, gravel, moisture, organic carbon (Walkley & Black) and total Nitrogen. 85 samples have had their mechanical composition and HCl soluble Potash determined and 50 samples have had HCl soluble Phosphate, total exchange capacity and exchangeable cations determined.

Field Work:

Field work has been very heavy this year as will be seen from the following record:—

(*a*) Present Manurial Trials—Fertiliser Applications and preliminary visits.

(1)	Nakiadeniya (twice)	*(2)	Stokesland (four times)
*(3)	Paiyagalla (four times)	(4)	Palmgarden (three times)
(5)	Epping Forest (twice)	(6)	Padukka (twice)
(7)	Degalessa (twice)	(8)	Dartonfield (twice)
*(9)	Hedigalla (twice)	*(10)	Moneragalla (three times)
*(11)	Ederapolla (six times)	*(12)	Paradise (four times)
*(13)	Rilhena (five times)	*(14)	Rayigam (four times)
*(15)	Halpe (four times)		

(Estates marked * have an experiment currently proceeding).

Total 15 estates 49 visits.

(*b*) Estates visited for possible manurial sites.

(16) Parambe (four visits)	(17) Sunnycroft
(18) Eheliyagoda	(19) Talapitiya
(20) Maha Oya	(21) Yogama
(22) Erracht	(23) Clunes
(24) Udabage	(25) Illuktenne
(26) Vincent	(27) Morali Oya
(28) Golinda	(29) Pallegama
(30) Atale	(31) Pussella
(32) Peenkande	

Total 16 estates 19 visits.

(*c*) Miscellaneous Experiments

(32) Pimbura—Weedkilling
(33) Gallawatte— ,,
(34) St. George— ,,
(35) Dalkeith (twice) Zinc deficiency and Oidium
(36) Nivitigalakele (six times) Latex Stimulation

Total 5 estates 11 visits.

(*d*) Advisory Visits.

(37) Hunuwella (twice) defoliation in immature areas.
(38) Wellandura wind damage.
(39) Wewakande (five times) severe leaf symptoms and debility)
(40) Lassahena General Agronomy
(41) Aga ,,
(42) Pebotuwa ,,
(43) Yahalakele (twice) ,,
(44) South Charley Mount ,,
(45) Hemingford ,,
(46) Dewalakande ,,
(47) Bellair ,,
(48) Kumarawatte ,,
(49) Pallekelly Soil survey conference with Professor F. Hardy.

Total 13 estates 19 visits.

(*e*) Visits made with Professor F. Hardy.

(50) Hunuwella	(51) Palmgarden
(52) Degalessa	(53) Parambe
(54) Stokesland	(55) Nakiadeniya
(56) Padukka	(57) Yahalakelle
(58) Mahawale	(59) Hedigalla

Total 10 estates 10 visits.

Grand Total 108 estate visits.

The following reports are made on the above:

Manurial Experiments:

3 × 3 × 3 NPK experiments on Nakiadeniya, Palmgarden, Mahawale and Padukka have been closed down and the results for 1957 are reported in Tables III to X.

The general interpretation is as follows:—

On Nakiadeniya Estate a definite Nitrogen effect which can be considerably enhanced by K in the less exposed areas.

On Palmgarden Estate a strong Nitrogen effect and a clear PK interaction the interpretation of which is obscure. This area is well supplied with biotite (or phlogopite) mica.

On Mahawale Estate no results, mainly due to the experiment being disturbed by heavy Fomes attacks.

On Padukka Estate clear Nitrogen effect plus possible K effect. Excluding Mahawale we have a clear Nitrogen effect plus a K reaction probably not over 50 per cent of the N effect. This is similar to our previous set of experimental results on the 1951-55 series.

On Paiyagalla Estate 3×3×3 NPK experiment (commenced 1956) no significant results have been obtained to date. On Degalessa and Epping Forest experiments have just been closed which compared three mixtures R 8:6:4, R 6:6:6 and R 4:6:8 at each of four levels. Results are given in Tables XI an XII.

In both experiments the type of manure has made very little difference though there is a slight trend towards N on Degalessa and K on Epping Forest which is in accordance with the known facts. There is a significant increase with the higher levels of manure regardless of mixture type and it appears that useful results may be obtained by increasing manurial applications to not more than double recommended rates.

This must be qualified by adding that useful results can only be expected if (1) the water supply (in the soil) is largely satisfactory and (2) the trees are not subject to wind damage.

Particularly the last proviso is becoming increasingly important and we are constantly being shown exposed areas in which strong wind is greatly retarding the growth of trees and causing a certain amount of malformation.

On Stokesland Estate a 4×2×2 experiment in N×P×K was closed in August owing to its close proximity to labourers' lines. A new NPK experiment was started in a more remote area.

A significant positive Potash result ($F=7.04$, $n_1=1$, $n_2=16$) of about 7 per cent was recorded on this experiment after 18 months, also a confused and just significant NP interaction which, on study of the figures, appears to be fortuitous.

A present difficulty, and one that has undoubtedly complicated our results for Potash in the past, is the potential Magnesium deficiency on almost all our soils to which PB 86 (the most popular clone) is excessively prone.

It is this factor which is probably responsible for the negative K effects which have been recorded in the oldest experiments of this department. We have therefore been faced with the need to incorporate Mg in our various experiments and at levels comparable to the K supplied. This obviously complicates our layouts to an unreasonable extent and makes them impracticable for the topographic conditions. In all cases, therefore, we are using a mixture of equal quantities of Muriate of Potash and Magnesium Sulphate where K is specified in a field experiment. This supplies the correct balance of Mg to K and should avoid depressant effects due to antagonism.

It is particularly noticeable with one Agency which has reverted completely to R 215, that Magnesium deficiency symptoms are still observed in young plantings of clone PB 86. There is no doubt that this is a very stubborn deficiency under our combination of circumstances and it appears as if it might be desirable to substitute 50/50 KCl/$MgSO_4 7H_2O$ in all cases where Potash is being used. As the importance of potash has now been established in Malaya and our Ceylon results confirmed, it appears that all rubber mixtures in Ceylon should contain this K/Mg combination.

On Hedigalla O, P, PK, NP and NPK are being tested in a Latin Square, each plot of which contains five clones. Results are given in Table XIII as the average of each plot.

Here the response to fertiliser P is about 27 per cent and to N in the presence of P 7 %. K in the absence of N is slightly depressant and in the presence of N about 2% positive in its effect. Both the P and N effects are highly significant but not the K effect.

The effect of exposure on the top of the hill is to cut growth by 8 per cent.

TABLE I

Zinc contents in fresh leaf (p.p.m.)

Sample	Tjir 1	PB 86	LCB 870
1a	4½	3	7½
1b	4½	3	8
2a	4½	3½	7½
2b	4½	3½	7½
3a	5½	3½	6½
3b	5½	3½	6½
4a	7	5	7½
4b	7	5	7
5a	7½	3½	6½
5b	7	3½	6½
Average	5.75	3.70	7.10

TABLE II

Leaf Analyses on deficient trees (all-over yellowing)

	N%	P%	K%	Ca%	Mg%	Fe ppm	Mn ppm	Zn ppm	Cu ppm	B ppm	Mo ppm
9 July	2.10	0.098	0.65	0.50	0.22	75	13	8	3	9	2
	2.20	0.108	0.80	0.58	0.20	78	8	5	5	14	3
6 August	1.92	0.104	0.70	0.83	0.19	98	30	36	4	9	2
	*3.06	0.218	0.58	0.64	0.18	93	38	39	14	20	3
	2.00	0.113	0.55	0.85	0.25	119	28	68	2	13	1
	*2.84	0.203	0.93	1.00	0.19	110	100	24	4	8	1
	2.09	0.105	0.58	0.69	0.28	130	28	39	6	10	½

*are control samples taken on the same day at Dartonfield.

TABLE III

Nakiadeniya 1957

Girths in inches

		A				B			
		K_0	K_2	K_3		K_0	K_2	K_3	
N_0	P_1	9.7	11.7	12.8		.83	11.1	11.9	
	P_2	12.7	11.1	9.3		9.7	9.0	10.2	
	P_3	11.8	10.0	13.4		12.6	11.7	9.6	
		34.2	32.8	35.5	102.5	30.6	31.8	31.7	94.1
N_2	P_1	10.7	13.8	12.7		11.4	11.0	9.3	
	P_2	11.6	12.0	14.2		12.3	12.2	11.5	
	P_3	11.2	11.1	14.1		10.9	12.7	12.7	
		33.5	36.9	41.0	111.4	34.6	35.9	33.5	104.0
N_3	P_1	13.5	10.9	13.4		11.3	12.5	10.9	
	P_2	10.3	13.2	14.8		12.8	11.9	12.6	
	P_3	9.9	13.6	14.6		12.7	11.8	11.2	
		33.7	37.7	42.8	114.2	36.8	36.2	34.7	107.7
Total		101.4	107.4	119.3	328.1	102.0	103.9	99.9	305.8

Block 1	100.7	Block 4	107.4
2	110.3	5	95.8
3	117.1	6	102.6

TABLE IV

Nakiadeniya 1957 (Girth Analysis)

A

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	34.2	33.1	35.2	102.5	34.2	32.8	35.5	102.5	P_1	33.9	36.4	38.9	109.2
N_2	37.2	37.8	36.4	111.4	33.5	36.9	41.0	111.4	P_2	34.6	36.3	38.3	109.2
N_3	37.8	38.3	38.1	114.2	33.7	37.7	42.8	114.2	P_3	32.9	34.7	42.1	109.7
	109.2	109.2	109.7	328.1	101.4	107.4	119.3	328.1		101.4	107.4	119.3	328.1

CF		3,987.02	
Total	26	67.59	
Blocks	2	15.09	
N	2	8.29	
P	2	0.02	
K	2	18.44	F = 3.75 Linear = 17.80 F = 7.24* Quad. = 0.64
NP	4	1.09	
NK	4	6.05	
PK	4	3.86	
Error	6	14.75	

B

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	31.3	28.9	33.9	94.1	30.6	31.8	31.7	94.1	P_1	31.0	34.6	32.1	97.7
N_2	31.7	36.0	36.3	104.0	34.6	35.9	33.5	104.0	P_2	34.8	33.1	34.3	102.2
N_3	34.7	37.3	35.7	107.7	36.8	36.2	34.7	107.7	P_3	36.2	36.2	33.5	105.9
	97.7	102.2	105.9	305.8	102.0	103.9	99.9	305.8		102.0	103.9	99.9	305.8

CF		3,463.46	
Total	26	41.34	
Blocks	2	7.55	
N	2	10.99	F = 4.38 Linear 10.27 F = 8.19* Quad. = 0.71
P	2	3.75	
K	2	0.89	
NP	4	5.98	
NK	4	1.15	
PK	4	3.51	
Error	6	7.52	

TABLE V

Palmgarden 1957

Girths in inches

		A				B			
		K_0	K_2	K_3		K_0	K_2	K_3	
N_0	P_1	10.1	8.3	9.6		13.6	14.2	14.0	
	P_2	8.7	10.1	9.8		14.5	12.8	13.9	
	P_3	8.9	11.5	9.6		15.5	14.6	12.0	
		27.7	29.9	29.0	86.6	43.6	41.0	39.9	124.5
N_2	P_1	12.7	10.2	8.8		12.5	14.6	16.2	
	P_2	9.1	10.9	11.4		12.8	14.3	14.4	
	P_3	9.7	11.7	10.9		17.2	14.2	14.6	
		31.5	32.8	31.1	95.4	42.5	43.1	45.2	130.8
N_3	P_1	12.3	12.7	10.0		14.9	16.0	15.4	
	P_2	10.8	8.8	14.4		14.9	13.7	14.9	
	P_3	10.9	10.6	9.8		14.9	13.5	14.6	
		34.0	32.1	34.2	100.3	44.7	43.2	44.9	132.8
Total		93.2	94.8	94.3	282.3	130.8	127.9	130.0	388.1

Block 1	92.5	Block 4	135.3
2	102.3	5	125.8
3	87.5	6	127.6

TABLE VI

Palmgarden A. (Girth Analysis)

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	28.0	28.6	30.0	86.6	27.7	29.9	29.0	86.6	P_1	35.1	31.2	28.4	94.7
N_2	31.7	31.4	32.3	95.4	31.5	32.8	31.1	95.4	P_2	28.6	29.8	35.6	94.0
N_3	35.0	34.0	31.3	100.3	34.0	32.1	34.2	100.3	P_3	29.5	33.8	30.3	93.6
	94.7	94.0	93.6	282.3	93.2	94.8	94.3	282.3		93.2	94.8	94.3	282.3

CF		2,951.60	
Total	26	54.19	
Blocks	2	12.59	
N	2	10.71	F = 6.25* Linear 10.42 F = 12.16 Quad. = 0.28
P	2	0.07	
K	2	0.15	
NP	4	3.21	
NK	4	2.09	
PK	4	20.23	F = 5.90*
Error	6	5.14	

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	41.8	41.2	42.1	125.1	43.6	41.6	39.9	125.1	P_1	41.0	44.8	45.6	131.4
N_2	43.3	41.5	46.0	130.8	42.5	43.1	45.2	130.8	P_2	42.2	40.8	43.2	126.2
N_3	46.3	43.5	43.0	132.8	44.7	43.2	44.9	132.8	P_3	47.6	42.3	41.2	131.1
	131.4	126.2	131.1	388.7	130.8	127.9	130.0	388.7		130.8	227.9	130.0	388.7

CF		5,595.84	
Total	26	33.95	
Blocks	2	5.65	
N	2	3.54	F = 4.13 Linear 3.29 F = 7.68 Quad. = 0.25
P	2	1.89	
K	2	0.49	
NP	4	3.78	
NK	4	3.72	
PK	4	12.31	F = 7.18*
Error	6	2.57	

TABLE VII

Mahawale 1957

Girths in inches

		A				B			
		K_0	K_2	K_3		K_0	K_2	K_3	
N_0	P_1	11.3	15.0	13.3		8.5	9.8	10.0	
	P_2	14.6	12.9	14.5		9.7	9.2	9.2	
	P_3	12.4	15.1	12.2		9.8	8.1	9.1	
		38.3	43.0	40.0	121.3	28.0	27.1	28.3	83.4
N_2	P_1	14.9	11.2	12.9		10.2	8.8	8.5	
	P_2	13.4	13.9	15.4		10.5	8.8	10.3	
	P_3	14.1	13.9	15.4		9.1	10.3	10.1	
		42.4	39.0	43.3	124.7	29.8	27.9	28.9	86.6
N_3	P_1	14.0	15.3	13.4		9.3	9.1	10.8	
	P_2	12.3	13.4	12.3		9.3	10.0	9.6	
	P_3	13.8	14.1	13.7		8.8	11.0	7.9	
		40.1	42.8	39.4	122.3	27.4	30.1	28.3	85.8
Total		120.8	124.8	122.7	368.3	85.2	85.1	85.5	255.8

Block 1	116.5	Block 4	78.5
2	128.6	5	89.0
3	123.2	6	88.3
	368.3		255.8

TABLE VIII

Mahawale 1957 (Girth Analysis)

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	39.6	42.0	39.7	121.3	38.3	43.0	40.0	121.3	P_1	40.2	41.5	39.6	121.3
N_2	39.0	42.3	43.4	124.7	42.4	39.0	43.3	124.7	P_2	40.3	40.2	41.8	122.3
N_3	42.7	38.0	41.6	122.3	40.1	42.8	39.4	122.3	P_3	40.3	43.1	41.3	124.7
	121.3	122.3	124.7	368.3	120.8	124.8	122.7	368.3		120.8	124.8	122.7	367.3

CF		5,023.88	
Total	26	35.67	
Blocks	2	8.17	
N	2	0.68	
P	2	0.68	
K	2	0.89	
NP	4	8.07	F = 1.75
NK	4	8.46	
PK	4	1.62	
Error	6	7.10	

B

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	28.3	28.1	27.0	83.4	28.0	27.1	28.3	83.4	P_1	28.0	27.7	29.3	85.0
N_2	27.5	29.6	29.5	86.6	29.8	27.9	28.9	86.6	P_2	29.5	28.0	29.1	86.6
N_3	29.2	28.9	27.7	85.5	27.4	30.1	28.3	85.8	P_3	27.7	29.4	27.1	84.2
	85.0	86.6	84.2	255.8	85.2	85.1	85.5	255.8		85.2	85.1	85.5	255.8

CF		2,423.46	
Total	26	16.52	
Blocks	2	7.66	
N	2	0.62	
P	2	0.34	
K	2	0.01	
NP	4	1.34	
NK	4	2.11	
PK	4	1.82	
Error	6	2.62	

TABLE IX

Padukka 1957

Girths in inches

		A				B			
		K_0	K_1	K_2		K_0	K_1	K_2	
N_0	P_1	12.8	12.9	13.3		11.1	12.6	11.8	
	P_2	12.0	12.7	14.0		12.2	10.9	12.5	
	P_3	14.8	12.9	13.8		9.7	11.4	11.4	
		39.6	38.5	41.1	119.2	33.0	34.9	35.7	103.6
N_1	P_1	11.5	13.1	13.8		14.1	11.4	12.6	
	P_2	14.2	12.4	13.0		10.3	11.9	12.6	
	P_3	12.4	14.8	14.2		11.6	13.7	11.8	
		38.1	40.3	41.0	119.4	36.0	37.0	37.0	110.0
N_2	P_1	14.3	13.7	13.4		11.8	13.1	13.3	
	P_2	13.1	13.3	13.7		12.1	12.8	12.0	
	P_3	13.7	13.2	15.2		14.0	12.4	12.4	
		41.1	40.2	42.2	123.5	37.9	38.3	37.7	113.9
Total		118.8	119.0	124.3	362.1	106.9	110.2	110.4	327.5

Blocks	A_1	117.4	
	A_2	117.5	
	A_3	127.2	
		362.1	

Blocks	B_1	116.7
	B_2	102.1
	B_3	108.7
		327.5

TABLE X

Padukka 1957 (Girth Analysis)

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	39.0	38.7	41.5	119.2	39.6	38.5	41.1	119.2	P_1	38.6	39.7	40.5	118.8
N_2	38.4	39.6	41.4	119.4	38.1	40.3	41.0	119.4	P_2	39.3	38.4	40.7	118.4
N_3	41.4	40.1	42.0	123.5	41.1	40.2	42.2	123.5	P_3	40.9	40.9	43.1	124.9
	118.8	118.4	124.9	362.1	118.8	119.0	124.3	362.2		118.8	119.0	124.3	362.1

CF		4,856.16		
Total	26	19.17		
Blocks	2	7.04		
N	2	1.31	F = 1.17	
P	2	2.95	F = 2.64	Linear 2.06 = 3.68 Quad. 0.88
K	2	2.16	F = 1.93	Linear 1.68 = 3.45 Quad. 0.48
NP	4	0.77		
NK	4	1.17		
PK	4	0.42		
Error	6	3.35		

B

	P_1	P_2	P_3		K_0	K_2	K_3			K_0	K_2	K_3	
N_0	35.5	35.6	32.5	103.6	33.0	34.9	35.7	103.6	P_1	37.0	37.1	37.7	111.8
N_2	38.1	34.8	37.1	110.0	36.0	37.0	37.0	110.0	P_2	34.6	35.6	37.1	107.3
N_3	38.2	36.9	38.8	113.9	37.9	38.3	37.7	113.9	P_3	35.3	37.5	35.6	108.4
	111.8	107.3	108.4	327.5	106.9	110.2	110.4	327.5		106.9	110.2	110.4	327.5

CF		3,972.45		
Total	26	27.66		
N	2	16.01	F = 7.67	Linear = 5.89 F = 15.03
P	2	1.22		
K	2	0.86		
NP	4	3.39		
NK	4	0.71		
PK	4	1.24		
Error	6	2.35		
Blocks	2	11.88		

TABLE XI

Degalessa Manurial Experiment

Average girths in inches

R 8: 6: 4	8.96″ ± .12	Top level	= 9.14″ ± .14
R 6: 6: 6	8.65″ ± .12	Level 3	= 8.72″ ± .14
R 4: 6: 8	8.79″ ± .12	Level 2	= 8.80″ ± .14
		Lowest Level	= 8.53″ ± .14

TABLE XII

Epping Forest Manurial Experiment

Average girths in inches

R 8: 6: 4	9.03″ ± .16	Top Level	= 9.33″ ± .19
R 6: 6: 6	8.90″ ± .16	Level 3	= 8.96″ ± .19
R 4: 6: 8	9.13″ ± .16	Level 2	= 8.91″ ± .19
		Lowest Level	= 8.87″ ± .19

TABLE XIII

Hedigalla 1957

Average Girths in inches

					Mean
11.4 — 0	15.6 — NP	14.5 — PK	14.3 — P	15.8 — NPK	14.3
13.4 — PK	15.3 — NPK	13.6 — P	13.9 — NP	11.8 — 0	13.6
15.0 — NP	13.4 — PK	13.6 — NPK	9.1 — 0	14.0 — P	13.0
15.5 — NPK	14.3 — P	11.5 — 0	13.8 — PK	14.7 — NP	14.0
14.9 — P	11.9 — 0	15.1 — NP	15.4 — NPK	13.9 — PK	14.2
Mean 14.0	14.0	13.7	13.6	14.0	

0	11.14″		
P	14.22″		
PK	13.80″	N_0P_1	14.01″
NP	14.86″	N_1P_1	14.99″
NPK	15.12″		

Soil Survey:

Mr. A. J. Jeevaratnam has been devoting half his time to soil survey and half to cover crop work. In the former, soils on nineteen estates have been examined by means of at least one pit plus confirmatory auger borings over as wide an area as possible. About 160 soil samples have been collected from these estates.

In addition, a reconnaissance survey consisting of samples at one mile intervals along the main roads through the rubber districts is also under way. Samples are being taken as near as practicable to the mileposts thus affording an opportunity of accurate mapping as well as making it possible to revisit the exact spot of a sample. About 50 miles has been covered in this manner so far.

In combination with this some 200 superficial rock samples have also been collected so that we may have a picture of the probable parent material in each area.

Actual numbers of analyses made this year are:

pH	...	210
Gravel fraction	...	,,
Moisture	...	,,
Organic Carbon (Walkley Black)	...	,,
Total nitrogen	...	,,
Mechanical composition	...	85
HCl soluble K	...	,,
HCl soluble P	...	50
Total exchange capacity	...	,,
Exchangeable Cations	...	,,

Cover Crop Investigations.—(By A. J. Jeevaratnam, Asst. Agronomist).

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

The following rhizobial strains were tested for nitrogen fixation during the year.

1.	R 272	ex R.R.I. Malaya
2.	RXV 362	,, N.S.W. Australia
3.	RXT 574	,, R.R.I. Ceylon
4.	RXT 576	,, R.R.I. Ceylon
5.	RXT 700	,, Queensland, Australia
6.	RXT 703	,, U.S. Dept. of Agriculture
7.	RXT 704	,, U.S. Dept. of Agriculture
8.	QA. 616 1.a.	,, Queensland, Dept. of Agriculture
9.	QA. 618 2.a.	,, —do—
10.	R.R.I.C./1	,, R.R.I. Ceylon
11.	R.R.I.C./2	,, R.R.I. Ceylon
12.	QA. 522	,, Queensland, Dept. of Agriculture
13.	QA. 548 b	,, Queensland, Dept. of Agriculture
14.	QA. 549	,, New Guinea *via* Queensland.
15.	CB 28	,, C.S.I.R.O. Queensland.
16.	CB 427	,, —do— —do—
17.	CB 443	,, —do— —do—
18.	Phaseolus strain	,, C.S.I.R.O. *via* C.R.I. Ceylon.

During the first half of the year inconclusive results were obtained due to unsatisfactory and inadequate greenhouse facilities. After the renovation to the existing greenhouse carried out in August some conclusive results were obtained.

Strains QA 548 b and QA 549 were definitely shown to fix nitrogen in *Pueraria phaseoloides* in sand + vermiculite trials. These were then tested on Dartonfield soil in pots, and found effective. Since the superiority of any particular rhizobial strain has to be demonstrated under field conditions, a field trial has been laid down at Nakiadeniya estate. A replanted area which had previously carried Pueraria and a new clearing from Kekilla land, definitely known to be nitrogen deficient, were selected for this field trial. It is too early to report on this experiment.

All other strains have failed to fix nitrogen in sand + vermiculite trials so far.

2. **Manurial.**

(*a*) Liming—A pot trial to assess the effect of liming on the common cover crops was undertaken. Initially liming showed an appreciable advantage but soon lost it and by six months, total growth of both limed and unlimed was the same. No differences in nodulation were observed.

(*b*) Two pot trials, using Dartonfield soil, were laid down to study the effect of adding different nutrients to inoculated and uninoculated Pueraria and Centrosema. These were of a pilot nature subsequent to the renovation to the greenhouse. The growth of plants in the greenhouse is not yet as satisfactory as would be desired. However, unhealthy leaf symptoms were observed quite independent of inoculation or addition of nitrogen, which indicated that unhealthy growth of the said cover crops may be independent of available nitrogen.

3. **Survey of Existing Cover Crops:**

Investigations on the chemical status and total nutrient value of cover crops, popularly grown at present, were undertaken during the year. Results of these investigations will be published when more data have been collected. A point of interest that may be reported now is that *Mikania scandens* has a significantly high K content of about 1½ per cent (dry) as compared to 0.25-0.35 per cent in leguminous cover crops.

4. **Introduction of new varieties:**

Desmodium uncinatum, *Psophocarpus palustris* and *Glycine javanica* were successfully propagated during the year. Since *Desmodium uncinatum* was noticed to grow well under shade, some cuttings have been planted under a stand of mature rubber for observation.

Psophocarpus palustris can be successfully propagated from cuttings. However, it is not a vigorous grower.

The growth of *Glycine javanica* has not been satisfactory.

5. **Field Experiment:**

A field experiment to compare the effects on young rubber of the different legumes and common weeds has been started, at Gallawatte 1957 clearing.

Tests of saphos phosphate only and a full NPK mixture are embodied in the trial to see if legumes can replace fertiliser nitrogen. Some difficulty was experienced in the establishment of the different cover crops in ten tree plots, but they are growing satisfactorily now.

Greenhouse Work:

During August the rebuilding of the old temporary greenhouse to give a semi-permanent structure was undertaken.

"Cascalite" (resin bonded glass fibre) was used for the roof and upper sides and asbestos sheeting for the lower sides all on a frame work of "Dexion". The sides have been made into permanent louvres by displacing the bottom edges of the asbestos and Cascalite sheets 12" outwards from the vertical. Completion of the ventilation cycle is achieved by slightly displacing the roof ridging to permit the outflow of heated air. The result has been that the maximum temperature has not exceeded 104° F and is generally not over 100°.

The relative humidity inside the greenhouse ranges from 50 to 90 per cent, depending on the time of the day.

The greenhouse is 40′ × 15′ × 7′ and cost some Rs. 2,500/-, the frame work being already available. It is estimated that for a house 40′ × 15′ × 10′ (15′ at the centre) suitable for reasonable size rubber plants the cost should not exceed Rs. 7,000/- for building.

The present house is now being used for pot trial with cover crops and for bioassay of soil types.

The former will be reported on by Mr. Jeevaratnam. In the latter we are at present investigating techniques such as suitable crops for our conditions, size, types of and materials for pots. Pureline Rice (Murungakayan 302) is proving satisfactory as a test crop and should do for N, P and K trials. Nothing, however, is known of its trace element susceptibilities and for this purpose various varieties of Tomato are being tried.

Locally made clay pots have been tried but are very badly made and poor as to regularity of size. Waxed paper containers (ice cream tubs) are proving more satisfactory and are now being covered with "Bituros" or "Bitumastic" black paint to give longer life.

To achieve a suitable water supply aluminium gutters have been fitted leading to "Bituros" painted tanks. The roofing being Cascalite the resulting drainage water has conductivity equivalent to $\frac{1}{2}$ p.p.m. of NaCl ($\frac{1}{2}$ Megohm Specific Resistance) or less. Further purification is carried out by Ion Exchange Resin columns.

A minor problem in the greenhouse is the entry of squirrels and lizards and it might be desirable to line the inside with fine chicken wire or even mosquito mesh. This will probably be necessary if trace element problems become acute since considerable fouling results from the presence of the various fauna.

Weedkilling:

Owing to the heavy visiting programme and shortage of material less was done this year on this problem.

Later in the year sample mixtures were made up and sent to estates for trial. Satisfactory and some doubtful results were recorded in line with our own findings.

At this stage the situation was reviewed. It was obvious that we had available three weedkillers all of which would destroy grasses under suitable conditions. As conditions and species varied fron estate to estate the possibilities of producing a universal answer seemed remote. Moreover it is practically impossible on most estates to achieve the even and regular spraying which is required if an exact answer is to be produced.

As the need for alternatives to present methods of cleaning clearings is immediate it was decided that the present results represented a practical proposition from the planters' point of view. A descriptive article was published suggesting the measures to be adopted, detailing the choice of mixtures and suggesting that small pilot tests should be done with each mixture to ascertain which suits the particular conditions best.

A mixture of Amizole and Pentachlorphenol appears particularly useful for grasskilling. We are the originators of this mixture and an article on its use has been accepted for publication by the Commonwealth Pesticides News and Abstracts.

It is not proposed to carry out further trials unless new and potentially useful products become available on the commercial scale in this country. We are using the mixtures suggested in our cover crop trials for clearing the land and this will provide us with a check on their performance.

The mixtures suggested for use on grasses are:

(1) Amizole/Pentachlorphenol (2-4 lbs. Weedazol plus 2 gallons Shell P 12 in 40 galls. mixture with water per acre)

(2) "Dowpon" (10 lbs. active material/40 galls/acre)

(3) "Dipentox" (4 galls. active material/40 galls/acre),

together with a boom sprayer preferably giving about an 8 foot strip.

We recommend strips spraying as a means of cutting the per acre cost, but for those who require 100 per cent cleaning of their clearings strip spraying is also suggested followed by a period of 3-7 days for results to become apparent followed by "filling-in" spray over the inter-strip areas. Any attempt at 100 per cent spraying at one time invariably leads to much wastage of material by double and treble spraying in the endeavour to leave no untouched patches.

Latex Stimulation:

An experiment has been undertaken on latex stimulation this year at Nivitigalakele. It was done on budded rubber, not of the highest yielding class, and showed large and extremely useful increases in yield. There was appreciable bark cracking due to the treatments but not to such an extent as to affect the yield improvement.

Detailed accounts of the experiment follow:

The experiment was started in March under the personal supervision of the Director who demonstrated the method of bark scraping and of application of the yield stimulant.

It compares Stimulex, R.R.I. Malaya Mixture, Dilatex, and Brunostim with a scraped control. There were 20 clones each with 4 trees to each treatment at the start of the experiment which began at the first tapping after wintering rest. Yield recording had taken place during the previous six months and the treatments were balanced to 8 per cent variation which is the correction referred to in the results.

The first effect noted was that the opening cut of the new season instead of producing only a few drops gave a normal cup full of latex and within three days we were having to use 1 lb. pudding bowls for collection from the heavier yielding trees. The maximum yields appeared to come between the 6th and 12th tappings and thereafter there was a steady decline of yield which after two months had not returned to the level of that of the scraped control trees, presumably due to the loss of depth of tapping with the Michie Golledge knife as a result of the swelling of the bark caused by the yield stimulant.

Individual yield recording was continued for fifteen tappings after which the daily intake per treatment was collected in a single bucket, made into sheet, and weighed. The results in the table give the total yields for the period, March to 30 June.

It was noticeable that the treatments, particularly 1, 2 and 3, caused some swelling and cracking of the bark which may, under Ceylon climatic conditions, cause an increase in the incidence of Bark Rot.

Treatment	Active Principle	Total Yield lbs.	Corrected % of control
RRIM Mixture	2, 4, 5–T	225	232
Dilatex	2, 4, 5–T	188	210
Brunostim	2, 4, 5–T	199	205
Control (scraped)	—	93	100
Stimulex	2, 4–D	210	226

The following conclusions may be drawn from this trial:—

(1) A yield increase of about 100 per cent average over 3 months' tapping can be obtained.

(2) This effect is fairly general over a wide selection of budded material of relatively low-yielding clones used in this experiment.

(3) There is no significant yield difference between any of the mixtures tried but there appear to be significant clonal reactions to the different mixtures.

Miscellaneous:

One of the principal events of the session was a visit by Professor Hardy, C.B.E., M.A., Emeritus Professor of Soil Science and Chemistry in the Imperial College of Tropical Agriculture, Trinidad. Professor Hardy was with us for a week during which time the following estates were visited: Hedigalla, Degalessa, Parambe, Stokesland, Nakiadeniya, Hunuwella, Palmgarden, Mahawale, Padukka and Yahalakelle.

In the course of the visits opportunities were taken to examine soil exposures wherever available and form opinions on the question of soil survey. Particular attention was paid to the phenomenon of laterite (cabook), its possible causes, and resultant soil effects. Subsequently the analysis of a number of soil samples has been carried out to assist Professor Hardy in his findings.

These analyses confirm the difficulties of estimating "available" nutrients in soils by methods not specifically developed for the conditions actually under review.

In addition to the above one visit was made to the Kelani Valley P.A. to which a lecture on "Recent manurial results" was given and two visits to the Kalutara District P.A. at which various questions were answered. Two visits were paid to the Latex Corporation of Ceylon before its final closing and, at the invitation of Messrs. Carson Cumberbatch, their annual Rubber Policy Conference was attended and advice given on various points raised.

An Advisory Circular 59A was issued giving the proportions of Soluble Magnesium to be incorporated in the various standard NPK mixtures. Attention was drawn to the fact that soluble Magnesium was probably desirable for PB 86 in the first two years from planting.

REPORT OF THE CHEMISTRY DEPARTMENT

By

E. J. Risdon

HIGHLIGHTS AND SUMMARY

During the period under review the main emphasis, apart from the usual advisory correspondence and visits, has been on the subject of the limitation of contamination, mainly of scraps, when dusting formulations are used to minimise defoliation due to phytophthora palmivora. Of the about 1,100 samples received from estates during and after the 1957 phytophthora season between 1.5 per cent and 3.1 per cent, depending upon the method of sampling etc., of the processed scrap samples tested contained more than about 7.9 p.p.m. of copper, the highest figure being just over 20 p.p.m. Careful examination of the data (Information Leaflet No. C/58/1) suggests that unless this reduced extent and seriousness of contamination in comparison with 1955 and 1956 is due to climatic or other factors beyond our control or advice, it should be possible in 1958 *with proper care in the field, etc.* and with controlled blending and testing in the factory to reduce the contamination to lower proportions. Comparative data on the relative suitability of a number of copper-containing fungicides suggests that Ciba 1 per cent may be most suitable *vis-a-vis* contamination. Experiments with C.I.S.I.R. rainguards have yielded interesting, but commercially valueless, information and, as a means of preventing contamination, these rainguards have not so far been a success. Extensive testing with the Plant Pathologist of an electroduster has failed to show convincingly that electrodusting "puts more copper on the leaf." Examination of the effect of the time interval between dusting and the collection of scraps suggests that (1) dusting and tapping should not take place on the same day and that (2) although a high proportion of all contaminated scrap samples are drawn on the first tapping day after dusting, contamination need not be restricted only to this time of sampling.

Appreciable numbers of estates have been visited with the object of organising for them in the field proper procedures for the minimisation of precoagulation. Further attention has been given to various aspects of R.S.S. manufacture and it has been found that with continuous strip coagulation (half size, 90 partition DCL tank) and a Brown's Guthrie Cadet 4 roller milling battery an output of 1000 lbs. per hour can be attained exclusive of any mill idling time due to tank movement, etc.

DETAILED REPORT

Section No. 1. General :

1.1. **Staff.**—The Department consists of the Chemist, the Research Assistant, Mr. M. Nadarajah, one Senior Technical Assistant, Mr. D. S. Muthukuda, three Technical Assistants, Messrs. T. S. Nathan, M. T. Veerabangsa and G. G. Gnanasegaram, and two Minor Staff Officers. Eight to fourteen seconded labourers are made available to the Department as and when required either by Estate Department or by direct day-to-day engagement locally. The

Chemist was absent on overseas leave from 27/3/57 to 31/7/57 and the Research Assistant was absent throughout the whole year on study leave under a Colombo Plan Scholarship at the University of Birmingham, U.K. During the absence of the Chemist and the Research Assistant, the Senior Technical Asst. was responsible for the conduct of the Department under the general supervision of the Director. A detailed programme of work was left by the Chemist for the guidance of the Senior Technical Assistant. Mr. T. S. Nathan, Technical Assistant, resigned his appointment with effect from December 31st, 1957. In order to limit the turnover of trained and valuable Assistant Staff Officers the Board has been requested to allow the appointment in the first instance of a further officer in the Senior Technical Assistant grade to be designated Senior Technical Assistant (Analytical).

1.2. **Advisory Services, Correspondence, etc.**—The report for 1956 (p.61) adequately emphasized the extent to which the uncertainty concerning the volume and nature of the advisory work makes the preparation of reliable estimates and programmes extremely difficult, and it is only necessary to comment here to the effect that the volume of advisory work in 1957 was of the order of that in 1956. The table below gives a summary of much of the data relevant to this subsection.

(*a*)	Unsolicited samples, etc. submitted for report or test	43
(*b*)	Solicited samples exclusive of T.C.R. and fungicide contamination samples.	271
(*c*)	Samples received from commercial estates in connection with fungicide contamination.	1089
(*d*)	Samples collected on Dartonfield Group in connection with fungicide contamination experiments. ...	1794
(*e*)	Correspondence incoming.	540
(*f*)	Correspondence outgoing	565
(*g*)	Groups of Visitors to the Department	22
(*h*)	Visits by the Staff of the Department (Details below)	176

By	R.R.I.C. Estates	Other Estates	Other Visits	Total
Chemist	6	17	10	33
Senior Technical Assistant	2	34	4	40
Technical Assistant	5	55	15	75
Minor Staff Officers	3	11	14	28

As previously, the figures in Column No. 2 of (h) above exclude (105) visits to Dartonfield Division (*e.g.* for the purpose of sampling in the fungicide contamination experimental 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 period under review, to which members of the Department have contributed partially or *in toto*, include the Annual Report for 1956 and four articles in the Quarterly Circulars (**32** 3, 4 p. 38-45, p. 46-52; **33**-1, 2 p. 6-34, p.35-38).

A further article on the subject of fragmentation, etc. has been awaiting publication since March 1957. Two further articles should be available early in 1958 and various others are under consideration. (In accordance with earlier Board requirements this Report is shortened in comparison with earlier Reports, *i.e.* 1955 and 1956.)

1.4 **Miscellaneous.**—Various samples and photographs for the R.R.I.C. stall at the Agri-Horticultural Show at Nuwara Eliya (April 17th-18th) were prepared or collected by the Department with the assistance of other Departments of the R.R.I.C. A Technical Assistant of the Department was in charge of the stall. The Hon. Minister of Agriculture and Food, attended by the Chairman and various members of the Board, inspected the Department during the course of his visit to the Institute. The Chemist attended a number of meetings of the Kalutara District Planters' Association. The Senior Technical Assistant spent an appreciable period checking various inventories for audit purposes.

Acknowledgement is made to the Estate Superintendent, Mr. L. Wijeyagunawardane, for the temporary services of Mr. O. de Alwis, Rubber Maker, to the Institute and now designated Factory Assistant, on a number of advisory visits. Grateful acknowledgement is made to the Director and Technical Officers of The British Rubber Producers' Research Association of Welwyn Garden City, for valuable advice, comments and information on various technical matters, particularly during the Chemist's recent visit to U.K. The Chemist would also like to express his personal thanks to Dr. G. F. Bloomfield of the B.R.P.R.A. and to Mr. J. A. Nelson, Secretary to the L.A.C., for their assistance in the preparation, etc. of his itinerary. For easy reference the numbering of subsequent Sections and subsections of this Report, is as far as possible, identical to that used in the Report for 1955 and 1956.

Section No. 2—Latex:

2.1. **Approximate Determination of the d.r.c. of Fresh Latex.**—Considerable reference has been made to this subject in earlier Reports with a summarizing article in the Quarterly Circulars (1955 **32**-2 p. 34-49). In the Report for 1956 (p. 62-63) reference was made to the effect on the metrolac reading of certain adulterants and of the addition of relatively large proportions of ammonia, and it is anticipated that in 1958 more attention may have to be given to other anti-coagulants. The article in the Quarterly Circulars emphasized that the presence of a very low factory excess is not necessarily evidence that the metrolac is measuring the d.r.c. of each individual lot of incoming fresh latex accurately as the errors could obviously balance out. In a similar manner it can be shown that the fact that the factory excess is positive and relatively constant is no reliable indication that there is no unnecessary loss of rubber during the various stages between weighing up and despatch, and it has for some time been our view that estates ought to consider the advisability of obtaining a more accurate measure of total incoming rubber even if the metrolac is still retained to estimate payments due to tappers, etc. Probably the most suitable method of obtaining a reasonably reliable estimate of the actual intake at the factory would be a trial coagulation on the bulks received from each Division, provided that the work is in the hands of a responsible officer at the factory. As an indication of the order of errors which can be found if it is assumed that bulking necessarily eliminates or balances out metrolac errors, we would mention that in connection with experiments on milling rates the average difference, d.r.c. by trial coagulation minus d.r.c. by the metrolac, of the bulked latex at the R.R.I.C. factory was 0.05 lbs./gallon at a metrolac d.r.c. of 1½ lbs./gallon, *i.e.* the error averaged over 3 lbs. per 100 lbs. of rubber and the standard deviation involved was .06 lbs./gallon.

During the period under review there have been a limited number of enquiries concerning means of avoiding a negative factory excess under conditions where there was little reason to presume undue losses in the factory as a result of excessive spillage, undercoagulation or inadequate checking at various stages. In one case the loss approached 25 per cent, much of which was probably due to the fact that tappers had noted that with unstable and thick latex the metrolac is liable to 'stick'. In this instance all the tappers on this estate were put onto trial coagulation procedures (50 ml samples per tapper per day) and the loss was reduced to 0.2 per cent. For this purpose Officers of the Institute visited the estate concerned on three occasions for periods of upto five days.

2.5. **Precoagulation.**—Enquiries on this subject are still being received from estates and it is, unfortunately, still apparent that the relevant R.R.I.C. and R.R.I.M. literature has not been examined in detail or, if it has, it has not been understood. In addition our advisory correspondence shows many examples of low outturn of No. 1 crepe and R.S.S. due to delivery to the factory of latex which is far too unstable for proper working. The correspondence also indicates that there are still a limited number of estates which have not appreciated the fact that where the tendency to precoagulation is at all marked early addition of the anticoagulant, *i.e.* in the cups as well as in the buckets, may be essential. There are five other points which might be mentioned here in connection with this subject : firstly, in the preliminary trials with an anticoagulant solution, either the application by a limited number of tappers must be supervised by a responsible officer, *e.g.* Conductor, S.D. or P.D., or the 'psychological conditions' must be such that the tappers concerned want to limit precoagulation. Secondly, the concentrations of anticoagulants suggested in Advisory Circular No. 53 are, as stated in the Circular, only suggestions and not inflexible recommendations. If, for example, a concentration of x per cent of, say, sodium sulphite has been applied correctly and is ineffective, then either 2 x per cent or 3/2 x per cent should be tried before presuming that this anticoagulant is useless. Thirdly, more anticoagulant may be needed at all stages in wet as opposed to dry weather and if it is not possible to issue stronger solutions to the tappers in wet weather it might in some cases be practicable to issue strong solutions to the tapping K.P. who can add extra anticoagulant to the buckets, if, on examination, he thinks this is necessary. Fourthly, the success or failure of an anticoagulant must largely depend upon its dispersion in the latex at all stages, so that in difficult cases there is clearly much to be said for ensuring good mixing of the latex and anticoagulant. For this reason a limited number of estates require (*a*) tapping K.P's to add any extra anticoagulant with a little stirring and (*b*) tappers to stir their cups in any interval between tapping and collection. For this reason also, we are not in favour of the 'pinch in the cup' method of addition of anticoagulants. Fifthly, where it is necessary to store latex from certain Divisions in the factory for one to two hours prior to the arrival of the balance latex and the completion of overall bulking, the procedure of adding much extra anticoagulant to the former latex in the bulking tank can be unsatisfactory if the latex is not relatively stable on arrival at the factory. Examples of discolouration and bubbles due in part at least to the latter procedure are known.

Appreciable numbers of estates have been visited for the purpose of organising trials with various anticoagulant solutions. In one case considerable success was obtained on slaughtered old seedling latex by the application of 0.15 per cent of sodium sulphite in the cups and buckets with 0.02 per cent of neutralised formaldehyde being added with a little stirring after collection of all the latex by the tapper. The addition of the formaldehyde was usually the responsibility of the K.P. on whom also devolved the responsibility of

increasing the dosage if required. It is anticipated that further visits of this nature to other estates will be requested in 1958.

2.8. **Preparation of Concentrated Latex.**—As Messrs. The Latex Corporation of Ceylon Ltd. have ceased operation in Ceylon, some further attention has been given to the subject of the small scale preparation of concentrated latex.

Section No 3—Smoked and Air Dried Sheet:

3.1. **Coagulation.**—During the period under review the Institute has purchased from C.C.C. a half-size 90 partition, continuous strip, DCL coagulation tank with the object of ascertaining (1) whether, without major alteration to the conventional locally built Brown's Guthrie Cadet sheeting battery and without any appreciable increase in final sheet thickness, the depth of latex and the standardisation d.r.c. can be increased beyond the usual figures of about 13″ and 1¼ lbs./gallon respectively, and, if so, (2) whether the milling rate is appreciably increased. Considerable time and attention has been given to these subjects, and, under our conditions, it would appear that with reasonable, but not impracticable, care 14″ depth of latex and a standardisation d.r.c. (by the metrolac) of 1½ lbs./gallon can be used with the half-size continuous strip tank to give an average milling rate of about 1,000 lbs./hour with a standard deviation of 10 lbs./hour. The figure of 1,000 lbs./hour does not include any allowance for removal of partitions, movement of tanks, etc. on the grounds that where the milling time on estates is already near the maximum, sufficient labour will probably be available to ensure that the mill idling time is purely nominal. Corresponding figures for slab coagulum, usually but not always obtained from the same bulk of latex, will be found in Table No. 3.1, where, subject to further experiments, both the depth of latex and the standardisation d.r.c. values quoted seemed to be near the optimum if difficulties at or after milling are to be avoided.

Coagulation Tank Characteristics and Guthrie Cadet Milling Rates.

Table No. 3.1

Tank Type	No. of partitions per 10′ of Tank	Depth of Latex	Standardisation d.r.c. (lb./gallon)	Average Milling Rate (lbs./hour)	Milling Rate Calcd. to 14″, 1½ lb./gallon
Continuous Strip	90	14″	1½	999	999
Slab Coagulum	90	13½″	1½	887	920
Slab Coagulum	75	13½″	1¼	768	956

While it would appear that under our conditions continuous strip coagulation can increase the milling rate when the tanks are supplied with 90 partitions, it is appropriate to mention that with a 4 roller sheeting battery the 'bends' in the coagulum are visible in the finished sheets in the form of surface irregularities. We are at present aware of no technological reason why such surface irregularities should result in a discount and upto the present Brokers have not commented adversely on this point. As far as we are aware continuous strip coagulation tanks are used outside Ceylon, and it would not appear inappropriate to consider their use at least on a small scale in Ceylon. In

connection with this subsection it is perhaps appropriate to emphasize that (1) on many estates milling rates (slab coagulum) do not exceed 650-750 lbs./hour, (2) the continuous strip tank used was a half-size version of a 90 and not of a 75 partition tank and that (3) there was no appreciable evidence of 'coagulum wandering' during milling.

3.2. **Milling.**—Reference is made to this subject in the preceding subsection where it will be seen (Table No. 3.1) that there is some evidence to suggest that when a Brown's Guthrie Cadet sheeting battery is used the highest milling rates can be obtained, as suggested earlier by O'Brien, with continuous strip tanks. As the last Column of the table corresponds to Column No. 5 reworked to 14" and 1½ lbs./gallon, it would appear that, although the absence of discontinuities during milling enhances the milling rate, an appreciable part of the extra output is due to the fact that extra depth of latex and a higher standardisation d.r.c. can apparently be used with the continuous strip tank. It is therefore appropriate to emphasize that upto the present our attempts to use 1½ lb./gallon and 14" depth of latex on the slab coagulum tanks have not been successful due to appreciable cases of one or more of (*a*) thick sheets, (*b*) thick edges due to doubling over, etc. resulting from excessive lateral spreading during milling or of (*c*) tearing during milling when attempts are made to decrease the final thickness. Upto the present 'wandering' of continuous strip coagulum has not resulted in appreciable doubling over at the edges, although this might of course occur with larger tanks.

With increasing crops due to replanting it must be presumed that in many cases milling batteries operating at no more than about 1,000 lbs./hour may be too slow so that it is appropriate to consider either alternative means of processing latex, modifications to the present batteries or the use of larger machines. During the course of the year the Institute wrote to various manufacturers of sheeting batteries outside Ceylon for quotations and guaranteed production rates. In most cases the cost of the machines was not considered to be justified at present, for our purposes. During the course of this correspondence the local manufacturers of the Guthrie Cadet suggested modifying the Institute's 4 roller sheeting battery to a 5 roller unit for experimental purposes, and it is proposed in due course to ascertain whether modifications of this nature together with alterations in mill speeds and processing characteristics will appreciably increase the output rate. While a scheme of this nature might minimize expenditure on mills it does have the obvious objection that mill width and hence in all probability the depth of latex will still be restricted.

3.4. **Drying and Smoking.**—Extensive reference has been made to this subject in previous Reports (1956 p.65-68, 1955 p.24-27) where the objectives of the work have been explained in some detail. Further attention has been given to this subject in the period under review but on a relatively reduced scale as the staff concerned have been rather fully occupied with routine type advisory work during and after the Chemist's absence on leave. For convenience, this subsection of the Report is, as usual, subdivided into suitable portions.

(1) Application of Basic Principles: Certain of the work in connection with attempts to ascertain the critical temperatures at which small bubbles are found in R.S.S. in the absence of pretreatment of coagulum has been repeated in the small (50 lbs.) experimental drying unit and based upon this information it has been found possible to dry milled sheet coagulum, at a dry weight of 8 ozs. per square foot, in 2¼-2⅜ days using temperatures ranging between 132°F (initially) and 142-144°F (finally). Drying in less than 3 days appeared to be possible with cycles ranging from 120°F to 140°F. The implication drawn from recent literature from Malaya to the effect that bubble

formation is retarded by operation at raised humidities seemed in a limited number of tests to be correct, but upto the present attempts to use this observation to reduce drying times have not been successful. The indications noted in previous Reports that operation at elevated relative humidities can have a marked adverse effect on drying time have been confirmed.

(2) Construction and Operation of Temporary Type Smoke-houses: Much of the work on this subject has now been summarized in the Quarterly Circulars (**33-1**, 2 p. 6-34). Careful examination of this article will indicate our views on current temporary type smoke-houses and will give some idea of how our views are applied to modifications of certain more permanent type buildings. During the period under review further advice has been given on a limited number of occasions to estates wishing to improve their temporary type smoke-houses and further reference may be made to this subject after completion of the alterations.

(3) Permanent Smoke-houses—R.R.S. Type: Further modification of the Nivitigalakele Division's smoke-house furnace has not been completed during the period under review for the reasons referred to in the first paragraph of this subsection. Although only a limited number of estates have modified their R.R.S. type smoke-houses for ground floor smoking, it is clear from the advisory correspondence and visits that a number of estates have recently built permanent and semi-permanent smoke-houses with provision for ground-floor smoking along somewhat similar lines. Unfortunately, in some cases adequate provision was not made, initially, for sufficiently uniform distribution of heat and smoke within a single horizontal plane.

(4) Permanent Smoke-houses—R.R.I.M. Tunnel Type: Following the completion of the extensions to the trolleys by Messrs. Brown & Co. Ltd., this smoke-house has been operated on a three day cycle by the Department and on a four day cycle by Estate Department. It is still our opinion that provided a reasonable measure of care is taken in the matters of standardisation, depth of latex, milling and temperature control a four and not a five day cycle is perfectly practicable, and with a little more care, particularly in the matter of temperature control at night, at least 90 per cent of the sheets weighing not more than about 8 ozs. per square foot, when dry, should be dry under our conditions in not more than three days.

A limited number of enquiries have been received concerning the suitability of the basic design of the tunnel type smoke-house as a multi-purpose drying unit. The implication here is that certain larger estates have considered that the relatively high cost of tunnel type smoke-houses in Ceylon might be covered by utilising the building for the drying of A.D.S. and of crepe laces as well as for the production of R.S.S. As far as we are at present aware there is no theoretical objection, but it is possibly inappropriate to presume that a smoke-house can be turned over to latex crepe lace drying without an extensive clean-up, so that the rapid switch-over from R.S.S. to crepe, which is sometimes required in Ceylon, might not be practicable. Following procedures outlined in Malaya the most suitable method of operation for drying latex crepe lace would probably involve an oil fired burner with or without a heat exchanger and probably means for partial recirculation of the heated air. The implication here is that in all probability a source of power at nights to drive the fans etc. would be desirable, if not essential—an arrangement which is not necessary in the R.S.S. type tower.

3.5. **R.S.S. Bale Coating and Marking Compositions.**—The Information Leaflet referred to in the Report for 1956 (p. 68) has been published during the period under review in the Quarterly Circulars. At the request of

the Rubber Commissioner a further 50 bales of R.S.S. 1 were coated with R.M.A. type bale coating composition and marked with improved red bale paint prior to despatch to China. A 2" wide red band round 3 faces of the bales was utilised as an additional indentification mark.

Section No. 5—Compounded Rubber:

5.1. **Equipment.**—No major items of new equipment under this heading are outstanding. The oxygen 'bomb' and the extruder have been taken into use during this period. An old vulcanising press received as a standby from London after the removal of the London Advisory Committee's technical staff to Welwyn has not yet been fully assembled. A second and standby Mooney Viscometer, to run on A.C., is awaiting the erection of a small A.C. Generator.

5.2. **Technical Classification of Ceylon Rubber.**—As no adequate survey of the T.C.R. properties of scraps crepes has recently been attempted in Ceylon, visits to certain Packing Houses in Colombo for other purposes were utilised to collect a range of samples suitable for a preliminary survey. Upto the present it has not been possible to give much attention to these samples.

5.3. **Copper Content of Ceylon Rubber and the Use of Copper Containing Fungicides.**—The data collected on this subject in 1957 and in previous years has been reviewed at considerable length in Information Leaflet No. C/58/1, copies of which have been circulated in Ceylon, and in an article in the Quarterly Circulars with the object of clarifying certain misconceptions and of emphasizing certain points of interest to the practical Planter. The possibility of controlled blending of scraps supplemented by an elaborate system of analysis is discussed in some detail, and it is emphasized that such systems may well be unsatisfactory if there is insufficient care in the field and factory. Information presented on the relative extent of contamination of processed scraps drawn from small scale dusting experiments suggests that an approved 1 per cent copper dust with a sticker may be most suitable. Further attention has been given to the subject of rainguards, without obtaining much useful information. Several experiments, with the Plant Pathologist, to assess certain aspects of the use of electrodusting as opposed to normal dusting do not clearly suggest that the former procedure is of much value under the conditions employed. A list of suggested precautions for the 1958 season is included.

5.4. **The Use of Organic Fungicides.**—Although it seems possible (Information Leaflet No. C/58/1) that, with approved copper dusts used with extreme care, the extent and seriousness of contamination can perhaps be minimized without the rejection of a large proportion of the final product, it is also obvious that under present conditions the arrangement is not ideal, as there is no guarantee that all concerned will at all stages proceed with the necessary caution. As the highest copper content so far encountered in commercially processed scrap samples (Ann. Rept. for 1956, p. 70) is over 175 p.p.m., it is, in the absence of more detailed information, reasonable to suggest as a rough and ready working hypothesis that, provided at least some care is taken to limit contamination, the ideal fungicide against phytophthora leaf disease is one which, when applied in the form of a dust containing not more than preferably 1 per cent or at the most 4 per cent of technologically active ingredient, does not have a significant effect on the technological properties of natural rubber when the technologically active ingredient is present in the rubber at a concentration of at least 220 p.p.m. It is, of course, also desirable that the fungicide should be effective against phytophthora under conditions which make it competitive with fungicidal dusts based upon copper.

In the Annual Report for 1956 (p.73-75) considerable reference is made to the use of 4 per cent Fermspray and it was noted that (1) this dust was found unsatisfactory, in terms of leaf retention, by the Plant Pathologist, (2) the active ingredient of Fermspray, *i.e.* ferric dimethyldithiocarbamate, is not necessarily without appreciable effect on the T.C.R. properties of natural rubber at a concentration of 250 p.p.m. and that (3), although the subject was not entirely clarified, it seemed likely that appreciable contamination may have occurred under commercial conditions. In 1957, therefore, the main emphasis has been on fungicides other than those whose active ingredient is ferric dimethyldithiocarbamate. The Department participated in discussions with commerical representatives concerning the suitability of dithane Z-78, whose active ingredient is zinc ethylene dithiocarbamate, for the control of phytophthora in 1957 and advised against any but very small scale trials on the grounds that (1) there was no *a priori* reason for the presumption that dusting formulations would be effective under local conditions and that (2) the validity of the suggestion that the active ingredient was without influence on natural rubber was doubted. Nevertheless small or medium sized trials were in fact carried out with 4 per cent, 6 per cent and 8 per cent dusts against phytophthora on commercial estates without, it is understood, much success. Experiments in the laboratory indicated that while dithane is not invariably as active an accelerator in A.C.S. 1 as Fermspray it is not without appreciable effect. In order to obtain an indication of the extent of contamination under various conditions an area of about 3 acres on Dartonfield Division was dusted with mainly 4 per cent dithane. But once it became clear that dithane was relatively ineffective, in terms of leaf retention, dusting, sampling and testing were suspended and it is unlikely that further attention will be given to this fungicide in 1958.

As trials were made in 1957 by the Plant Pathologist with a fungicide whose trade name is captan and whose active ingredient is believed to be N. trichloromethylthiotetrahydrophthalimide, preliminary tests were made to ascertain the effect of this fungicide on A.C.S. 1 mixes cured for various times at 140°C. The general conclusion is that captan should be regarded as a retarder of vulcanisation in A.C.S. 1 and under the T.C.R. conditions the strain values were increased by between 3.8 and 10 units when the active ingredient concentration was not above 250 p.p.m. At undercures the effect was generally correspondingly larger. As indicated in earlier Reports (1956 p.74) fungicides which are marked retarders of vulcanisation could be undesirable, at least in certain cases, as appreciable proportions of latex blankets are somewhat slow vulcanising even in the absence of contamination. As it is understood that captan was ineffective in terms of leaf retention at concentrations roughly competitive with 4 per cent and 6 per cent copper dusts, it is unlikely that any further attention will be given to this chemical in 1958. During 1957 the Plant Pathologist gave some attention to a Ciba dust referred to within the Institute as Ciba 2 per cent carbamate. It is understood that this dust is based upon zinc dimethyldithiocarbamate and contains an unstated amount of Ciba's effective sticker. Preliminary tests in the laboratory indicated, as might be expected, that the active ingredient is an effective accelerator of vulcanisation in the A.C.S. 1 formulation and that the effect is noticeable even at concentrations of the order of 50 p.p.m. Further attention may be given to this fungicide in 1958, and, pending the collection of more detailed information, it must be concluded that this fungicide should not be used except with at least reasonable care to prevent contamination.

There has been some discussion with the Plant Pathologist on the suitability of certain newer fungicides in mind as panel fungicides.

5.5. **Superior Processing Crepe.**—As an appreciable number of enquiries have been received at this Institute for information on the use of Superior Processing Crepe, it is appropriate to indicate firstly that this material is not a substitute for sole crepe and secondly that the policy of the Rubber Research Board in connection with products which might be loosely classified as special products is that work on such products shall carry little priority. For the latter reason little work has been carried out on this subject in 1957, although it is anticipated that the matter may receive more attention in 1958.

5.6. **Carbon Black Master-batches.**—Requests for information on the preparation of softened natural rubber carbon black master-batches have been received from a local firm, but it is not yet been possible to give all the information requested.

5.7. **Colouration of Panel Fungicides.**—During the period under review the Institute has been advised that further complaints have been received about the discolouration of scraps due to the incorporation of pigment, usually Swedish Red, in panel fungicides such as Brunolinum Plantarium solution. The commercial objection, which is in our opinion entirely justified, is due partly to the fact that the scraps are appreciably discoloured red and partly to the fact that the scraps are, in fact, natural rubber scraps with a filler, and, as such, are almost certainly not proper tender under R.M.A. rules. Presumably the contamination takes place when coloured Brunolinum Plantarium solution is applied just above, and, in many cases, onto, partially dried panel scraps; as the application is often made after each tapping in wet weather, it is clear that without proper care the extent of discolouration of raw panel scraps could be quite marked. During the period under review the Department has therefore continued its experiments designed to ascertain how Swedish Red can be used in Brunolinum Plantarium solutions without discolouration of processed scraps, and whether there are more suitable colouring agents which can be employed when tapping is not suspended. The difficulties in connection with the use of pigments include the following: (1) the requirements in terms of visibility of the application of the fungicide and the absence of contamination of scraps are mutually incompatible, so that the concentration to be employed is liable to be rather critical, (2) there is little evidence to suggest that pigments will be selectively retained by the tree rather than by the scraps, (3) insoluble pigments such as Swedish Red are usually heavy powders which readily settle out of solution and (4) with careless scrap collection coloured scrap is actually a mixture of coloured scrap and coloured bark. Examination of the use of Swedish Red concentrations over the range .25 per cent to 6 per cent suggests, as indicated earlier by this Institute, that the optimum concentration is about 2.5 per cent, *i.e.* 4 ozs. of Swedish Red per gallon of diluted Brunolinum Plantarium. It is clear from comparison with our experimental areas that many estates have been using more than 6 per cent of Swedish Red and inquiry has shown that in an appreciable number of cases there is no control at all over the addition of pigment to the panel fungicide solution. It is not our suggestion that uncoloured curl scrap will necessarily be obtained when 2.5 per cent of pigment is used with reasonable care, but we have not noticed significant discolouration of the processed scraps. Subject to later modifications, the procedures at present used on Dartonfield Division involve the following:—

(1) The use of 2.5 per cent of Swedish Red, *i.e.* 4 ozs. (by weight) per 1 gallon of diluted Brunolinum Plantarium,

(2) The issuance of instructions to tappers who apply the panel fungicide, and to the labourers who prepare the solution in the factory, that the mixture must be well stirred during preparation and immediately

before and during distribution and application. This is particularly important and is designed to minimize the rapid settling of pigment into the last lots of the fungicide solution.

(3) The collection of 'clean' scraps, *i.e.* the collection of scraps with the minimum amount of coloured bark.

(4) Soaking scraps on receipt at the factory, *i.e.* without allowing them to dry, for about 2 days in water containing about 2 ozs. of detergent (Stanvac E 40, Teepol) per 100 lbs. scrap prior to normal scrap washing and milling.

Following suggestions in the literature from Malaya, .06 per cent of methylene blue has also been tried, but in our present opinion this colouring agent does not resist monsoon showers adequately and the mark is only visible on rather close inspection. Higher concentrations (.1%-.5%) give a colour which in our present opinion is not readily distinguishable from that left by conventional waterproofs such as Cargillineum. Alternative mixtures based upon 0.5 per cent of Du Pont's lithosol Red C.S.P. paste seem at present to be at least as satisfactory on the tree as Swedish Red but cannot yet be recommended for large scale use.

The suggestions given above are based upon the use of the panel fungicide some time after tapping, as recommended in the relevant Advisory Circular, but, as some estates have applied panel fungicide during and just before tapping, it is appropriate to mention that cases of discoloured latex crepes due to this cause have been reported.

REPORT OF THE SMALLHOLDINGS DEPARTMENT

By

R. T. Wijewantha

SUMMARY

With the further issue of a fairly large number of replanting and new-plantings permits, and the expansion of the sulphur dusting scheme for smallholdings, the work of this Department both in the field and in the office has increased considerably during the year under review. The author was on duty throughout the year. All 3 Assistant Advisory Officers were away on their end-of-contract leave each during the course of the year.

Two Rubber Instructors were selected for promotion as District Field Officers by the Rubber Research Board and posted to Matugama and Avissawella respectively with effect from 1-8-57.

14 New Rubber Instructors, 1 Clerk and 2 Replanting Assistants were appointed during the year. 3 Rubber Instructors left the Department and 1 Rubber Instructor was discontinued.

Loans for the purchase of motor vehicles were allowed to 7 field officers of the Department.

A substantial increase in the volume of correspondence was recorded.

Rubber Instructors conducted 240 sheet-making demonstrations. 400 sq. ft. of mesh for strainers and 300 aluminium pans were sold at concession rates. Instructors paid 1,917 visits to smokehouses. 107 tapping, 394 disease-control and 189 miscellaneous demonstrations were also given by the field officers.

The Director inspected at Kesbewa and Gampaha several smallholdings which had been newplanted, replanted or sulphur dusted. Mr. John Greenwood of the Rubber Research Institute of Malaya, studied the work of this Department for a week, and was impressed by the methods adopted.

Coloured Advisory Leaflets on Oidium and on "Sulphur Dusting of Smallholdings in 1957/58" were published and distributed among smallholders. A detailed report on Sulphur Dusting in 1956/57 was also submitted.

5,971 Replanting permits covering 8,503 acres of smallholdings were issued for 1957. Rubber Instructors lined 3,628 acres in 2,636 holdings for soil conservation work and 3,465 holdings covering 4,856 acres for planting holes. 203 visits were made by field officers for random inspection of planting material issued from Rubber Commissioner's Depots to replanting smallholders.

5,676 preliminary inspections on the suitability of lands for new planting of rubber were made by field officers.

In all 21,828 visits for advisory work or lining were made by the field staff.

A sum of Rs. 7,102/25 was paid out to peasant-class new-planters a soil conservation grants during the year. A total of 118,735 high yielding clonal seedlings were issued to new-planters.

In addition to the usual advisory work, several special inspections were undertaken at the request of the Rubber Controller. In all 8,092 such special inspections were made.

A survey on the incidence of White Root Disease (Fomes lignosus) revealed that 19.2 per cent of all replanted smallholdings were infected. The extent of infection within a particular holding was, however, generally very small. Suitable advice was given in each of the above cases and satisfactory control measures adopted. A copy of the S.H. Leaflet on Fomes was also issued to each of these permitholders.

A total of 3,119¾ acres of smallholdings were successfully sulphur dusted against Oidium during the dusting season 1956/57. This constitutes the **largest** acreage of smallholdings to be dusted in one season and a detailed report on the dusting scheme is available at the Head Office, Dartonfield, as R.R.I. Circulation Paper No. 2003 of 4-7-57.

For the dusting season 1957/58, arrangements have been completed for dusting of 4,800 acres of smallholdings in 51 co-operative groups. In all about 1,462 holdings will be dusted. Sulphur will be supplied at a concession rate to all smallholdings below 10 acres in extent. It is anticipated that about 3,350 acres will be benefited by this subsidy.

DETAILED REPORT

1. INTRODUCTION:

With the further issue of a fairly large number of replanting and new-planting permits, and the expansion of the sulphur dusting scheme for smallholdings, the work of this Department both in the field and in the office has increased considerably during the year under review.

The author was on duty throughout the year. All 3 Assistant Advisory Officers were away on their 3 months end-of-contract leave each, during the course of the year. Mr. H. H. Peiris resumed duties on 1-5-57 and Mr. K. Wilson de Silva on 1-8-57. Mr. N. W. Palihawadana, the Senior Assistant Advisory Officer, was on leave from 11-8-57 to 12-11-57.

Two Rubber Instructors, Messrs. M. B. Dissanayake and L. A. Wijesinghe, were selected for promotion as District Field Officers by the Rubber Research Board and posted to Matugama and Avissawella respectively with effect from 1-8-57.

2. GENERAL:

Establishment:—The following new appointments were made:—

Mr. P. Wijekoon	Temporary	Rubber	Instructor	with	effect	from	22-2-57
Mr. G. W. Jayawardene	,,	,,	,,	,,	,,	,,	1-3-57
Mr. P. Thiviyanayagam	,,	,,	,,	,,	,,	,,	1-3-57
Mr. J. C. Illangantileke	,,	,,	,,	,,	,,	,,	1-3-57
Mr. A. J. L. de Silva	,,	,,	,,	,,	,,	,,	2-5-57
Mr. P. W. David	,,	,,	,,	,,	,,	,,	2-5-57
Mr. U. S. Wijayapala	,,	,,	,,	,,	,,	,,	2-5-57
Mr. H. M. K. Fonseka	,,	,,	,,	,,	,,	,,	2-5-57
Mr. E. S. Kularatne	,,	,,	,,	,,	,,	,,	3-5-57
Mr. J. Sumanasekere	,,	,,	,,	,,	,,	,,	6-6-57
Mr. K. I. Ariyaratne	,,	,,	,,	,,	,,	,,	15-8-57
Mr. K. Ekenayake	,,	,,	,,	,,	,,	,,	15-8-57
Mr. J. D. W. Jayawardene	,,	,,	,,	,,	,,	,,	2-9-57
Mr. H. M. H. B. Herath	,,	,,	,,	,,	,,	,,	2-9-57
Mr. W. A. Austin Perera	,,	Clerk	—	,,	,,	,,	1-3-57
Mr. P. I. N. Fernando	Replanting	Assistant	—	,,	,,	,,	1-3-57
Mr. S. D. Atukorala	,,	,,	—	,,	,,	,,	1-3-57

The new Rubber Instructors, were given a course of lectures and practical training in rubber work, and in the use of the road-tracer, etc. before being posted to their Ranges.

Mr. S. K. Navaratne, temporary Rubber Instructor, who joined the Department on 1-8-55 left us on 10-4-57 having secured employment elsewhere. Mr. P. Wijekoon, temporary Rubber Instructor, left this Department on 8-5-57 after only 2½ months service, to take up appointment under the Gal Oya Board. Mr. J. C. Illangantilake joined us on 1-3-57 and left on 29-8-57. One Rubber Instructor was discontinued with effect from 31-5-57.

The reorganisation of the Department consequent on the heavy increase in the amount of work was completed in July. The staff position at the end of the year was as follows:—

1 Smallholdings Advisory Officer
1 Senior Assistant Advisory Officer
2 Assistant Advisory Officers
6 District Field Officers
44 Rubber Instructors (41 in charge of Ranges)
6 Clerks
4 Replanting Assistants
2 Peons.

Loans:—Loans for the purchase of motor vehicles were allowed to 7 field officers of the Department.

Correspondence:—A substantial increase in the volume of correspondence during the year was recorded.

General:

Inward	5,252
Outward	9,046

With Rubber Controller:

Inward	796 (including 500 packets applications and Final Inspection Reports).
Outward	7,889 (Including 5,676 preliminary reports and 1933 Final Reports).

From Field Officers to Permit-Holders:
3,660 (not included in the above figures).

Sheet Improvement:—Rubber Instructors conducted 240 sheet-making demonstrations. 400 sq. ft. mesh for strainers and 300 aluminium pans were sold at concession rates. Instructors paid 1,917 visits to smokehouses.

Demonstrations:—In addition to the sheet-making demonstrations, 107 tapping, 394 disease control and 189 miscellaneous demonstrations were also given by the field officers.

Visits:—The Director, Dr. E. D. C. Baptiste, inspected sulphur dusted holdings and replantings at Kesbewa and Gampaha on 4-6-57.

Mr. John Greenwood, of the Smallholdings Advisory Service, Rubber Research Institute of Malaya, followed the work of this Department from 19th to 23rd November, 1957.

In his address to the Rubber Replanting Advisory Board on 27-11-57 Mr. Greenwood stated that he had been greatly impressed by the standard of work on the smallholdings which he had visited.

3. PUBLICATIONS:

The 4th new Advisory Leaflet was published during the year. This leaflet on Oidium was printed in blue in both English and Sinhalese.

A detailed report on the sulphur-dusting of smallholdings in 1956/57 was submitted. This has been issued as Circulation Paper No. 2003 from Dartonfield.

Leaflet No. 4/A entitled "Sulphur Dusting of Smallholdings 1957/58" was also published and distributed among interested smallholders during the course of the year.

4. RUBBER REPLANTINGS:

The following subsidy replanting permits were issued by the Rubber Controller for 1957:—

	Permits	*Ac.* *R.* *P.*
Estates —over 100 acres	440	11,113— 0—03
Estates —between 10-100 acres	1,139	8,334— 0—10
Smallholdings—under 10 acres	5,971	8,503— 2—27
	7,550	27,950— 3—00

Copies of all permits issued to smallholders were received from the Rubber Controller and forwarded to the Rubber Instructors of the areas concerned. 16,399 visits were paid during the year to smallholdings including 8,790 made in respect of previous year's permit-areas. 2,636 holdings covering 3,628 acres were lined by Rubber Instructors and Assistants for soil conservation work and 3,465 holdings covering 4,856 acres for planting holes.

At the request of the Chairman, Rubber Replanting Advisory Board, officers of this Department carried out random checks on the planting material issued from the Rubber Commissioner's Depots to subsidy replanters. In all 203 visits were made by Field Officers and a total of 28,955 plants examined. The major part of the planting material was issued from the Rubber Controller's nursery at Egaloya and Hedigalla.

A letter of appreciation of the valuable services rendered by this Department in making the Replanting Scheme a success in relation to smallholdings was received from the Rubber Controller who is the Chairman of the Rubber Replanting Advisory Board.

5. NEW PLANTING OF RUBBER:

In spite of the heavy calls made on the time of the field staff by replanting and sulphur dusting duties, sufficient attention was also paid to this important aspect of work.

All new areas are inspected by Rubber Instructors who report on their suitability for planting of rubber before permits are issued. 5,676 such pre-

liminary reports were sent to the Rubber Controller during the year, and 4,117 new-planting permits covering 6,446 acres were issued by him for the year. In all 21,828 visits for advisory work or lining were made by the field staff.

Record sheets are maintained in respect of all N.R.P. smallholdings and all visits made and the work done or recommended are entered therein. 19,086 such record sheets were forwarded to the Rubber Controller for reference and return to enable him to "register" these lands.

Instructors and Assistants lined 1,361 acres in 1,032 holdings for planting holes and 1,159 acres in 902 holdings for soil conservation work.

Soil Conservation:—A sum of Rs. 7,102/25 was paid as grants to 119 peasantclass permit-holders. All Rubber Instructors are required to measure all soil conservation works, for which payment is claimed, before submission of vouchers. All such claims are counter checked by District Field Officers or Assistant Advisory Officers before payment is approved.

Planting Material to New Rubber Planting Permit-Holders:—Although arrangements were made with the Department of Agriculture to supply 175,000 Tjir clonal seedlings from various Government Farms for issue to New Rubber Planting Scheme permit-holders in 1957, only 118,735 seedlings, as noted below, were available for issue during the year:—

Source		*Free to peasants.*	*Sales to M/C Permit-Holders*	*Total*
Mapalana Farm	...	7,960	3,247	11,207
Peradeniya Nursery	...	5,286	2,375	7,661
Walpita Farm	...	14,849	2,040	16,889
Wagolla Farm	...	6,109	1,135	7,244
Labuduwa Farm	...	12,207	5,075	17,282
Horana Farm	...	46,556	5,115	51,671
Karapincha Farm	...	6,351	430	6,781
		99,318	19,417	118,735

It was estimated that about 300,000 clonal seedlings would be required for issue in 1958. On receipt of a letter from the Director of Agriculture intimating that the Government Farms would not be in a position to meet our requirements, the Director, Rubber Research Institute, was requested to make arrangements for an alternate supply of suitable planting material.

It would, however, appear that for 1958 the issue of approved planting material will be done away with. It is needless for me to stress that in this eventuality the purpose of the New Rubber Planting Scheme will be defeated as most smallholders will plant their lands with **ordinary** low yielding rubber since they will not be able to afford the purchase of approved planting material from commercial sources.

6. SPECIAL INSPECTIONS FOR RUBBER CONTROLLER:

In addition to the usual advisory work attended to by this Department up to the end of last year, several Special Inspections were undertaken at the request of the Rubber Controller.

In all 8,092 such special inspections were made at the expense of a considerable amount of time of trained technical staff.

Special technical reports	...	280
Visits for inspection of planting material before issue	...	203
Preliminary Reports prior to issue of permits	...	5,676
Final Inspection Reports after completion of planting	...	1,933
Total	...	8,092

7. WHITE ROOT DISEASE:

The survey on the incidence of Fomes lignosus in replanted smallholdings, which was commenced in the latter part of the previous year, was completed in 1957. The survey confirmed the author's earlier observations that a rather alarming proportion of all replantings were infected by Fomes lignosus. Interesting observations can be made from the figures obtained. A full analysis will be submitted in due course for publication. Meanwhile summarized information on the main facts are given below.

All smallholdings replanted during the period 1953-55 were surveyed. In all 6,267 smallholdings had been replanted. Of these, 1,201 holdings comprising 19.2 per cent were found to be infected with Fomes (Table I and Histogram I).

TABLE I

Year	Total No. of Holdings		% Infection
	Planted	Infected	
1953	243	77	32
1954	2,300	610	26.5
1955	3,724	514	13.8
	6,267	1,201	19.2%

On analysis of these figures according to divisions, it was observed that the percentage of infection was highest in the Matugama division (35.5%) with Ratnapura division a close second (31%). The lowest percentage was recorded for the Colombo division with 2.8 per cent of the holdings showing infection [Table II and Histogram II (annexed)].

TABLE II

Division	Total No. of Holdings Planted			Total	Total No. of Holdings Infected			Total	% Infected
	1953	1954	1955		1953	1954	1955		
Kegalla	23	406	663	1,092	3	54	18	75	7
Avissawella	52	363	689	1,104	16	107	86	209	19
Colombo	43	359	570	972	1	12	14	27	2.8
Ratnapura	48	321	577	946	19	136	136	291	31
Matugama	53	548	822	1,423	29	256	220	505	35.5
Galle	24	303	403	730	9	45	40	94	13
	243	2,300	3,724	6,267	77	610	514	1,201	19.2

The figures were re-analysed on the basis of acreages as opposed to the previous figures regarding holdings.

10,393 acres of smallholdings had been planted during the 3 years 1953-55. Holdings covering 2,038 acres were reported as being infected. 19.6 per cent of the total replanted acreage being shown to be infected.

TABLE III

Year	Total No. of Averages		% Infected
	Planted	Infected	
	A. R. P.	A. R. P.	
1953	511-3-02	161-0-19	31.4
1954	3,724-0-13	1,047-1-36½	28
1955	6,157-1-03½	829-2-06	13.5
	10,393-0-18½	2,038-0-21½	19.6

The percentage of infection according to divisions confirmed the earlier figures. The highest percentage was recorded for the Matugama division and the lowest for Colombo. [Table IV (annexed)].

In every case where Fomes had been discovered to be present, suitable advice was given by the field staff and a copy of the S.H. Leaflet on this subject distributed.

The Fomes Survey will be continued in 1957/58 as a means of following up whether infection has subsided or whether it is spreading and also to check up whether the holdings previously reported as free of Fomes have shown subsequent infection.

8. SULPHUR DUSTING OF SMALLHOLDINGS:

1956/57:—The organisation of the 1956/57 Dusting Scheme for Smallholdings was outlined by the author in his Annual Report for 1956. Sulphur dusting was on practically the same lines as in the previous trial years.

Wintering occurred at more or less the usual time. A careful watch was kept and the first holding to require dusting—*i.e.* when the green buds on the leafless twigs were just beginning to sprout on approximately 10 per cent of the trees in a holding—was at *Talangama.* This land was selectively dusted on 20th December, 1956. Thereafter dusting in the other groups followed in rapid succession.

The first group to complete dusting was the one at *Matugama* where all work was concluded on 25th February, 1957. The last to finish was the *Dompe* Group which completed its last round of dusting on 27th March, 1957.

A total of 3,119¾ acres in 704 holdings were dusted in the 1956/57 season. This constitutes the largest acreage of smallholdings to be dusted in one season.

No. of holdings dusted	...	704
Acreage dusted	...	3,119¾
No. of dusting groups	...	30
No. of acres per machine (av.)	...	104
Size of smallest holding	...	½ acre
Size of largest holding	...	34 acres
Average No. of holdings in group	...	23
Average size of each holding	...	4½ acres.

The sulphur dusted holdings showed significantly beneficial results and nearly all dusted holdings were 95-100 per cent free of Oidium. Owners of dusted holdings have, without exception, expressed their satisfaction with the results obtained and all expressed their desire to join the scheme next year as well. The over-all average cost of treatment amounted to Rs. 18.09 per acre.

All balances due to owners from the deposit of Rs. 15/- collected at the commencement of the scheme to be set off against the cost of sulphur supplied, were duly refunded.

A detailed report on the Dusting Scheme is available at the Head Office at Dartonfield as R.R.I. Circulation Paper No. 2003 of 4-7-57.

1957/58:—According to the proposals for co-operative dusting of smallholdings, it was suggested that an approximate extent of 5,000 acres of rubber in 50 dusting groups be dusted against Oidium in 1957/58.

Sulphur dusting in the forthcoming season is to be on slightly different lines when compared with the 1955/56 and 1956/57 schemes in that sulphur is to be supplied at a subsidised rate to smallholdings below 10 acres in extent. Another point of difference is that each group will appoint a machine-operator to attend to day-to-day dusting and so relieve the Rubber Instructor of this routine work.

Intimation of the availability of funds for sulphur dusting was received early (7-9-57) and this was of considerable help to this Department. Orders were placed for dusting machines and suitable sulphur immediately thereafter. On special representation made by this Department, Messrs. A. Baur & Co., the Agents for Mistrals, agreed to supply our requirements (23) at a special price of Rs. 1,350/- per machine *i.e.* at Rs. 250/- less than the current market price. A considerable saving was thus effected.

At the September Divisional Conferences which the author attended, the entire Scheme was explained in detail to all field staff. An idea of the number of groups which could be formed in each range was obtained from the information submitted by the various Rubber Instructors. On 10th October, 1957, a circular letter was sent to the field confirming the tentative arrangements made previously. It was agreed that it may be possible to form about 51 dusting groups in all.

The proposed scheme was advertised in the Press by the usual notification in both Sinhalese and English (on 9-10-57). An attractive leaflet on dusting was printed about the same time and then issued to the field staff to be distributed with the application forms among smallholders.

The response from the public was very poor and the requisite number of groups were formed almost entirely due to the efforts of the field staff. The poor price of rubber and continuous rain were factors which contributed towards the lukewarm interest shown by the smallholders.

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

The 51 groups were to be distributed as follows:—

Kalutara	District	...	15
Colombo	,,	...	12
Kegalle	,,	...	9
Ratnapura	,,	...	6
Galle	,,	...	6
Matara	,,	...	3
			51

Owing to the low rubber prices now prevailing two of the above groups defaulted, and these were replaced by two new groups, 1 at Neboda and 1 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.

Approximately 4,800 acres in 51 groups will participate in the Co-operative Sulphur-Dusting Scheme in 1957/58. Of this 3,356 acres *i.e.* 70 per cent will be provided with sulphur dust at a subsidised rate. In all about 1,462 holdings will be dusted. The average number of holdings per group will be much higher than last year, 27 per group as opposed to 23 per group in 1956/57.

Distribution of the dusting machines was commenced on 9-12-57 and completed by the end of the month. So also the sulphur dust.

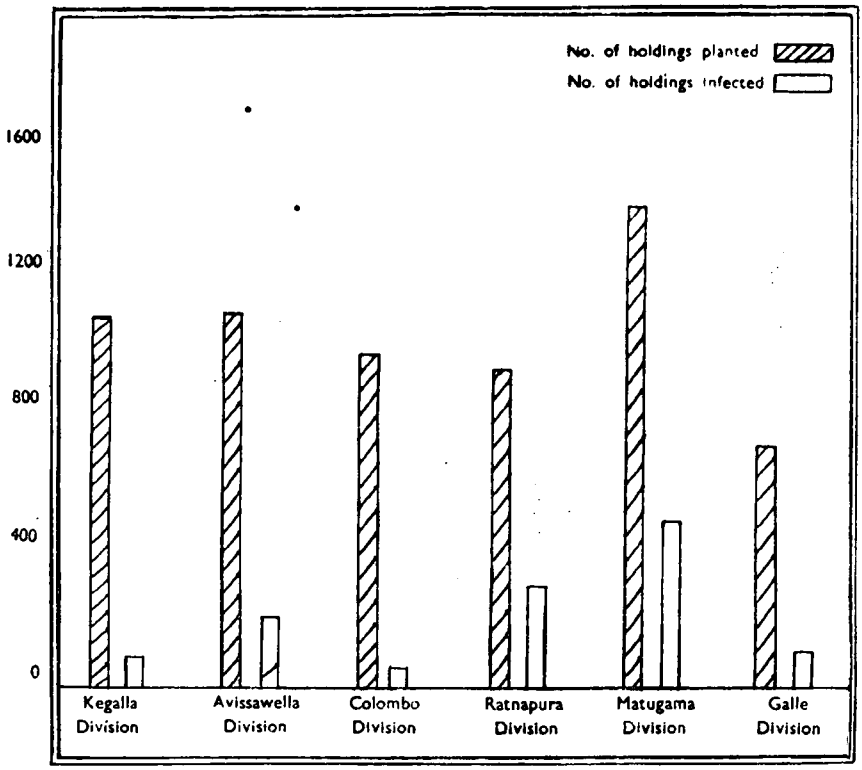
Dusting demonstrations for purposes of instructing the field staff were held at Kosgama, Horana and Batapola, under the supervision of the author, on 16th, 17th and 18th respectively. The various Rubber Instructors held dusting demonstrations to instruct their respective groups thereafter. They were required to complete these instruction classes by the end of December and have everything in readiness for commencement of dusting when refoliation sets in.

Defoliation in all probability will be late this season. According to the information so far received, it would appear that the Hiniduma and Pita-beddara groups may be among the earliest to require dusting. Already yellowing has been noticed in several holdings in these groups.

Histogram 1

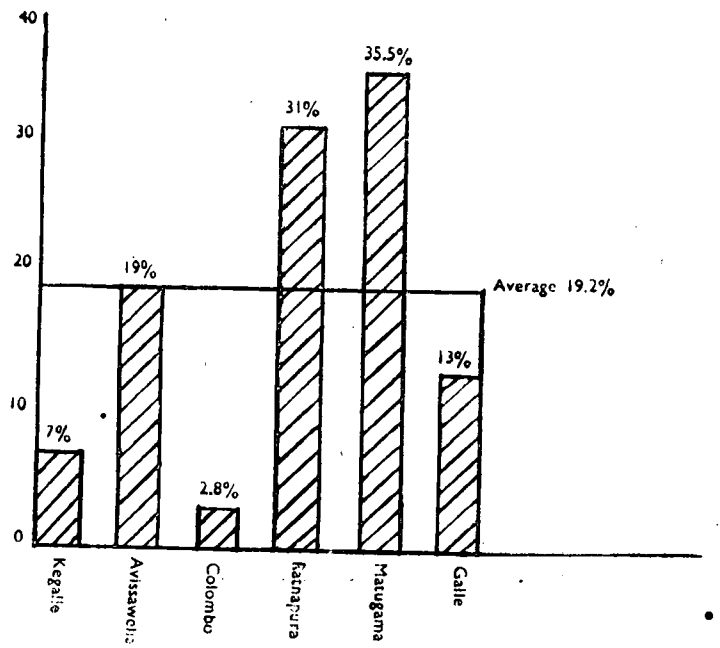
ANNEXURE 1

Number of Holdings Infected According to Divisions



Histogram 2

Percentage of Infection According to Divisions



ANNEXURE 2

TABLE IV

Division	Acreage Planted			TOTAL	Acreage Infected			TOTAL	% Infected
	1953	1954	1955		1953	1954	1955		
	A. R. P.	A. R. P.	A. R. P.	A. R. P.	A. R. P.	A. R. P.	A. R. P.	A. R. P.	
Kegalla	47 0 00	602 1 28½	1,114 3 13	1,764 1 01½	4 1 00	90 0 02	31 1 10	125 2 12	7.1
Avissawella	108 2 25	622 3 10	1,186 3 31	1,918 1 26	33 1 39	192 2 20	134 0 10	360 0 29	19
Colombo	97 2 10	557 0 06½	809 1 33	1,464 0 09½	1 0 00	21 2 22	18 1 30	41 0 12	3
Ratnapura	82 2 11	523 2 36	935 3 26½	1,542 0 33½	31 1 01	217 1 18	233 2 29	482 1 08	31.3
Matugama	101 3 23	848 1 06	1,259 3 26	2,210 0 15	59 0 39	436 2 11½	330 1 15	826 0 25½	37.4
Galle	74 0 13	569 3 06	850 0 34	1,494 0 13	31 3 20	89 1 03	81 2 32	202 3 15	13.6
	511 3 02	3,724 0 13	6,157 1 03½	10,393 0 18½	161 0 19	1,047 1 36½	829 2 06	2,038 0 21½	19.6

REPORT OF THE ESTATE DEPARTMENT

By

L. Wijeyagunawardena

SUMMARY

Dartonfield Group.—The planted acreage of the Group comprising Dartonfield, Nivitigalakele and Hedigalla divisions stands at approximately 1,026 acres, of which 352¾ acres were tapped during the year. At Hedigalla 77 acres were under nursery for the Rubber Replanting Subsidy Scheme.

Unusual weather conditions were experienced this year. The third quarter of the year was exceptionally dry with an unprecedented low rainfall of 1.19 ins. in September. The normally good cropping months of November and December proved particularly unconducive to harvesting of crop due to heavy rains.

A very satisfactory crop was, however, obtained totalling 225,991 lbs. and representing a yield of 653 lbs. per acre. Both crepe and ribbed smoked sheet were manufactured. The price differential obtaining for crepe and sheet determined the type of manufacture carried out.

The immature rubber acreage was 652 acres for the year. Approximately 16 acres were newly planted at Hedigalla during the North-East planting season.

The incidence of Oidium heveae was light and control measures adopted proved effective, resulting in an even, healthy refoliation. Phytophthora leaf fall was less pronounced than last year and presented no difficulty.

Control measures were adopted with regard to root diseases in accordance with the recommendations of the Rubber Research Institute.

Budwood of 50 disease-resistant Latin American clones was received from Plant Introduction Station, Miami, U.S.A., at the end of the year and was budded in the Nivitigalakele Nurseries.

Half an acre of nursery with Tjir 1 twinned seedlings for the Plant Pathology Department and 695 hand-pollinated seedlings of the 1957 pollinations were planted in specially prepared beds at Nivitigalakele Division.

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

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

The Rubber Replanting Subsidy Scheme Nursery at Hedigalla continued to be supervised throughout 1957. The acreage planted increased from 52 acres in 1956 to 77 acres in 1957. This nursery is now in full production. 31,818 of PB 86 budded stumps and 201,166 of Tjir 1 seedling stumps were issued from this nursery during the year.

Estimates for 1958 for Dartonfield Group were prepared by the writer and accepted by the Rubber Research Board. In connection with Hedigalla Nursery an estimate for 1958 was drawn up and submitted to the Rubber Replanting 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.

Staff:—Subject to the following changes, the Department's staff remained same.

Mr. H. M. Buultjens was seconded for service as Nursery Manager, R.R.S.S. Nursery at Hedigalla, with effect from 1st January.

Mr. J. Pitchamuttu took up duty as Senior Field Assistant, Dartonfield, on 1st January. He resigned on 28th March.

Mr. H. A. Haramanis, K.P., was promoted Junior Field Assistant, with effect from 1st January.

Mr. T. S. J. Peiris was upgraded and designated as Office Assistant, Estate Department, with effect from 1st December.

Mr. J. D. J. Sirisena, Motor Vehicles Driver, resigned on 2nd September.

The following new appointments were made:—

Mr. B. H. Rodrigo, Clerk with effect from 1st April.

Mr. G. D. Francis, Field Assistant, (Agro. Dept.) with effect from 2nd January. He resigned on 29th May.

Mr. M. Gunawardena, Field Assistant, (Agro. Dept.) with effect from 15th July.

Mr. M. C. Perera, Field Assistant, (Bot. Dept.) with effect from 1st August.

Deaths of the following officers are recorded with deep regret:—

Mr. D. S. Attygalla, Field Attendant, on 4th June.

Mr. L. H. M. de Silva, Workshop Foreman, on 3rd November.

The cadre of the Estate Department stands at 44, made up as follows:—

Senior Staff	...	1
Assistant Staff	...	22
Minor Staff	...	21

Acreage Summary—Dartonfield Group:

Rubber	*Dartonfield*	*Nivitigalakele*	*Hedigalla*	*Total*
Mature	80–2–18	131–1–19	140–3–36	352–3–33
Immature	63–1–00	20–0–08	568–2–31	651–3–39
Nurseries	4–2–00	16–1–00		20–3–00
Total Rubber	148–1–18	167–2–27	709–2–27	1,025–2–32
Abandoned due to wind damage		2–0–04		2–0–04
Building sites	23–0–37	1–0–28	8–0–34	32–2–19
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	396–2–04	398–2–02
Total ...	178–1–26	474–1–12	1,138–1–32	1,491–0–30

The total cultivated acreage of the Group was 1,026 acres by the end of the year as against 1,010-3-31 in 1956. The increase is due to the New Planting at Hedigalla Division during the North-East Planting Season. The acreage in full bearing increased from 323-1-38 in 1956 to 352-3-00 in 1957.

Weather:—(Estate Gauge) Dartonfield Rainfall figures for 1953-1957 are shown below:—

Month	1953 *ins.*	1954 *ins.*	1955 *ins.*	1956 *ins.*	1957 *ins.*	*Quinquennial average* 1953-1957
January ...	3.75	11.66	7.63	5.42	2.66	6.22
February ...	5.12	9.62	13.96	3.10	7.96	7.95
March ...	15.21	17.46	13.66	7.87	8.26	12.49
April ...	10.10	17.13	11.75	25.04	12.53	15.31
May ...	4.96	30.10	32.23	16.50	20.85	20.93
June ...	6.79	6.47	23.09	16.45	15.83	13.73
July ...	34.69	8.55	13.89	2.77	11.22	14.22
August ...	6.67	9.78	2.87	13.04	7.37	7.95
September ...	8.87	10.54	20.78	12.60	1.19	10.80
October ...	24.28	28.66	21.20	18.58	13.65	21.27
November ...	15.17	10.76	22.11	18.48	21.95	17.69
December ...	11.93	19.32	6.26	11.87	23.30	14.54
	147.54	180.05	189.43	151.72	146.77	163.10

Total No. of Wet days in 1957 ... 179
„ „ „ „ „ „ 1956 ... 172

The rainfall for the year at Dartonfield amounting to 146.77 inches spread over 179 days fell short of the quinquennial average by 16.32 inches. The third quarter of the year recorded an exceptionally low rainfall of 19.78 inches as against the average of 32.97 ins. September was particularly dry with a fall of 1.19 ins. During the fourth quarter, December registered an unprecedented fall of 23.30 ins.

The division at Hedigalla recorded a rainfall of 181.15 ins., as against 168.61 ins. the previous year.

Crop:—The crop harvested for the season was very satisfactory in spite of the marked interference to tapping during the normally good cropping months of November and December due to heavy rains.

	1957	1956
Estimate	200,000	184,060
Harvested	229,454*	208,754
Excess	29,454	24,694

*This includes 3,463 lb. received from other estates as test tapping biscuits. The actual amount harvested therefore is 225,991 lb.

Comparative yield records of individual fields

Dartonfield	Acreage in tapping	Total yield in lb. 1957	Total yield in lb. 1956	Yield per acre 1957	Yield per acre 1956
1934 Replanted Area	7½	9,449	5,009	1,259.9	667.8
1936 ,, ,,	9½	6,742	6,935	709.7	730.0
1938 ,, ,,	19½	15,340	13,432	786.7	688.8
1939 ,, ,,	2	1,547	1,230	773.5	615.0
1941 ,, ,,	6½	5,546	4,849	853.2	746.0
1947 ,, ,,	10¼	7,501	8,078	731.8	788.1
1950/51 ,, ,,	25¾	5,084	—	197.4	—
	81	51,209	39,533	632.2	715.5
Nivitigalakele					
1926 Replanted Area	13	7,798	8,365	599.8	643.4
1927 ,, ,,	9¾	7,474	6,000	766.6	600.0
1928 ,, ,,	10½	6,716	7,580	639.6	481.2
1935 ,, ,,	30½	21,949	18,033	719.6	632.7
1939 ,, ,,	10¼	10,123	9,119	987.6	889.6
1940 ,, ,,	9¾	8,198	8,919	840.8	914.7
1940 Swamp Area	3¼	3,715	3,046	1,143.1	937.2
1941 Clearing	7	7,704	8,503	1,110.6	1,214.7
1942 ,,	4½	4,388	4,696	975.1	939.2
1943 ,,	7	4,105	2,737	586.4	912.3
1944 ,,	4½	4,300	4,080	955.6	906.5
1946 Replanted area	21	25,406	26,530	1,209.8	1,262.3
	131	111,876	107,608	854.0	821.4
Hedigalla					
1943 Clearing	10¼	7,650	9,205	746.3	898.0
1944 ,,	11¾	7,688	8,982	654.3	764.6
1945 ,,	22¼	9,753	11,509	438.3	517.2
1946 ,,	12¾	8,216	9,831	644.4	771.1
1947 ,,	45	20,428	13,452	453.9	298.9
1949 ,,	34¾	8,171	5,041	235.1	145.1
1950/51 ,,	4	1,000	—	250.0	—
	140¾	62,906	58,020	446.9	424.3
Total for the Group	352¾	225,991	205,161	652.9	635.2
T.T. Biscuits from outside estates	—	3,463	3,593		
	352¾	229,454	208,754		

Tapping:—(*a*) Tapping was resumed on 15th March after one month's rest during refoliation. During this period, tapping panels were marked with the appropriate bark consumption in keeping with the systems of tapping adopted on the various experimental clearings.

(*b*) The system of tapping in the 7½ acre 1934 replanted area at Dartonfield was changed over in March to ladder tapping on V/2 d/2 100 per cent intensity, the V cuts being 4 feet above the normal tapping panels. Comparatively high yields were obtained as shown by the yield records above.

(*c*) The over-all drop in yield per acre at Dartonfield is due to the 1950/51 clearing of 25 acres brought into tapping.

(*d*) The drop in yield in the 1943 clearing at Nivitigalakele division is due to the increased acreage from 3 acres in 1956 to 7 acres in 1957 taken into tapping.

(*e*) The heavy rainfall at Hedigalla division caused considerable loss of tapping days together with increased late tapping, particularly in the 4th quarter of the year.

Analysis of tapping rounds for 1957 (1956 figures in brackets)

	Early tapping		*Late tapping*		*Resting*		*Rain*		*No tapping Holidays*	
1st Quarter	59	(47)	—	(4)	30	(30)	—	(—)	1	(–)
2nd Quarter	56	(50)	18	(20)			11	(25)	6	(6)
3rd Quarter	58	(57)	27	(29)			7	(6)	–	(–)
4th Quarter	35	(56)	46	(26)			11	(10)	–	(–)
	208	(210)	91	(79)	30	(30)	29	(41)	7	(6)

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	71,607	31.21	
,, ,, No. 2	2,165	.94	
,, ,, No. 3	1,278	.56	
Pale Crepe No. 1	71,292	31.07	
,, ,, No. 2	17,426	7.59	
,, ,, No. 3	19,093	8.31	
Latex for experiments	2,554	1.13	
	185,415	80.81	
Scrap Grades			
Scrap Crepe No. 1	34,357	14.97	*The percentage
,, ,, No. 2	8,785	3.83	of scrap is high
,, ,, No. 3	367	.16	due to the test
Scrap for experiments	530	.23	tapping biscuits.
	44,039	19.19*	
GRAND TOTAL	229,454	100.00	

Estate Roads and Paths:—All roads, paths and steps were maintained in good condition throughout the year.

Manuring:—All mature areas were manured in keeping with the Institute's recommendations.

Weeding:—Mature rubber areas in tapping were well weeded and maintained clean and tidy.

Pests and Diseases:

Oidium heveae:—The first three months of the season was particularly dry and considerably inhibited the activity of Oidium. Nivitigalakele and Hedigalla divisions had a mild attack in pocketed areas which were well under control with the successful Sulphur dusting operations and resulted in an even healthy refoliation.

The first refoliation in Dartonfield was comparatively poor as a result of dusting at a reduced dosage. This was purposefully carried out to obtain a medium foliage with a view to ascertain what results this would have, covering the control of Phytophthora leaf fall. Dusting rounds were closed up for the second refoliation and very satisfactory canopy of leaves was obtained.

Phytophthora palmivora:—This season there was little or no infection at Dartonfield and Nivitigalakele divisions. Minor infection occurred on road side trees more or less confined to Hedigalla division where the rainfall was particularly high. Dusting with Copper Sandoz was, however, carried out as a precautionary measure throughout the three divisions.

Bark Rot:—Applications of the water-miscible phenolic disinfectant Brunolinum Plantarium and S.V. Treseal were made to tapping cuts in wet and dry weather respectively. The old lesions of Bark Rot at Hedigalla, where the rainfall is appreciably high, caused some concern. The removal of these was systematically carried out during the dry spells, in conjunction with the Pathology Department.

Root Diseases—Fomes (Leptoporus) 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.

Wind Damage:—Unlike the previous years no serious wind damage occurred.

Thinning out:—All areas of the Group where the plantings are over three years of age, were thinned out where necessary. This was carried out in conjunction with the Research Departments.

Capital Account—Agricultural Development:

Dartonfield Division—Immature Replanted Area

1952	Replanted area	—	34¼
1953	,, ,,	—	16½
1954	,, ,,	—	7¾
1955/56	,, ,,	—	4¾
			63¼

Nivitigalakele Division—Immature Areas

1953 Clearing	—	10
1954 ,,	—	10
		20

Hedigalla Division—Immature Areas

1950/51 Clearing (part)	—	16
1952 ,,	—	79½
1953 ,,	—	142
1954 ,,	—	177½
1955 ,,	—	78
1956 ,,	—	60
1957 ,,	—	10
		563

1954 Clearing, Hedigalla—177½ acres:—The plants in approximately fifty acres of this clearing situated in a wind swept area on comparatively poor soil, showed marked backwardness in growth. Special monthly applications of manure for a period of eight months were carried out and the area has improved remarkably.

1957 Clearing, Hedigalla—(N.E. Planting):—Approximately 16 acres, felled and cleared in the previous year which remained unplanted was lined and holed at a planting distance of 8′ × 30′, giving a planting density of 180 plants per acre. This was planted in accordance with the requirements of the Botany Department. The material consists of 2,990 plants of hand-pollinated seedlings and clones derived from the following:—

1954/55 hand-pollinated seedlings, 1945 hand-pollinated seedlings from Dartonfield, 1945 hand-pollinated seedlings from Hedigalla, 1951 crosses of LCB 870, RRIC 51, 64 and CH 26 with PB 86 as control.

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 *Clg.*	1953 *Clg.*	1954 *Clg.*	1956 *Clg.*
Fomes (Leptoporus) lignosus	6	8	6	13	3
Ustulina zonata	1				
Wind Damage	17				
Thinning Out	152				
Building sites	115				
	291	8	6	13	3

Nivitigalakele	*Mature Areas*	1953 *Clg.*	1954 *Clg.*
Fomes (Leptoporus) lignosus	3	7	7
Brown Bast	14		
Bleeding Canker	12		
Wind Damage	33		
Ustulina zonata	17		
Building sites	57		
	136	7	7

Hedigalla	*Mature Areas*	1951 *Clg.*	1952 *Clg.*	1953 *Clg.*	1954 *Clg.*	1955 *Clg.*
Fomes (Leptoporus) lignosus	2	7	10	56	104	7
Fomes noxius	—	4	16	11	4	3
Wind Damage	4	4	2			
Thinning Out	13			342		
	19	15	28	409	108	10

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.

Nurseries at Nivitigalakele Division:

(*a*) **Seedling Nurseries:**—(i) **H.P. Seedlings.**—695 H.P. Seedlings of the 1957 pollinations were planted in specially prepared beds.

(ii) **Twin Seedlings.**—(Pathology Dept.) An area of about ½ acre was cleared in the 5 acre nursery to accommodate approximately 17,000 Tjir 1 twinned seedlings. The twinning was carried out at the nursery.

(iii) **Clonal Seedlings.**—21,475 mixed clonal seedlings were planted in vacant beds of the 2 acre nursery.

Budding and Attention:—Budded stumps were prepared for the new planting requirements at Hedigalla for the North-East Planting. In addition the following buddings were carried out for St. George and Eladuwa Estates and the Department of Agriculture in connection with clone trials on outside estates.

St. George Estate:—TR 1406 (317), IRCI 3 (324), IRCI 2 (290), AV 529 (315) and RRIM 607 (266).

Eladuwa Estate:—AV 1734 (60), PR 254 (24), RRIM 603 (20), RRIC 61 (27), WR 101 (41), AV 2037 (90), RRIM 612 (39), TR 1648 (114) PR 248 (30) and RRIC 76 (30).

Dept. of Agriculture:—PB 86 (900), RRIC 52 (340), AV 255 (700) and LCB 1320 (460).

Budwood of fifty different disease-resistant Latin American clones received from Plant Introduction Station, Miami, Florida, U.S.A. were budded under the direct supervision of the Botanist. This material consisted of 20 FX clones and of 30 IAN clones.

(*b*) **Budwood Nurseries:**—(i) Approximately 2 acres of nursery beds were prepared in order to increase the number of planting points of the most promising RRIC clones with a view to enhance the supplies of RRIC budwood now much in demand.

(ii) A further 3 acres of Budwood Nursery at Dartonfield is being laid out for the same purpose.

Budwood Distribution:—3,898 yards of budwood of various clones were sold to estates and smallholdings, and 25 yards of budwood of various local clones were despatched to U.S.A. on an exchange basis.

Field and Factory Experiments:—The Agronomy, Botany, Chemistry and Pathology 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 Board Ordinance in force.

DARTONFIELD GROUP:

Working Ceylonese		*Resident*	*Non-resident*	*Total*
Men	...	111	148	259
Women	...	78	63	141
Children	...	—	—	—
Working Immigrants				
Men	...	38	—	38
Women	...	29	—	29
Children	...	—	—	—
Grand Total	...	256	211	467

Annual Holidays:—Annual holidays with pay were given to all labourers who were entitled to these in accordance with the ordinance.

Maternity Benefits:—19 full maternity benefits and 4 medical wants benefits payments were made.

Feeding Children and Milk Foods:—Free rations and ¼ 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:—23 children were born during the year on the Group.

Deaths:—There were three deaths on the group this year.

A list of diseases treated by the Institute's Apothecary is given below:

Influenza	...	478
Ulcers	...	100
Ankylostomiasis	...	86
Other intestinal parasites	...	91
Other diseases	...	1,578
Total	...	2,333

MAINTENANCE WORKS—REVENUE ACCOUNT:

General Buildings:—The offices and laboratories were maintained in good order.

Bungalows:—All bungalows due for colour-washing, etc. were done in the course of the year and repair works wherever necessary were attended to.

Water and Power Supply:—There was a severe shortage of water due to drought conditions during September/October and all staff co-operated in rationing the use of water.

In spite of the non-commission of the National Engine due to a break-down the power supply was kept up uninterrupted.

Bungalow Furniture:—Repairs wherever necessary to furniture were done.

Motor Vehicles:—An Austin Diesel Latex Tanker was purchased second-hand from the Latex Corporation of Ceylon bringing the total to six made up as follows:—

Lorries	...	2
Cars	...	4

Machinery:—Messrs. H. W. Hammond & Co., Consulting Engineers, visited the Institute on 7th and 8th February and inspected all Machinery and Electrical Equipment. Their Report dated 11-2-57 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:—5 B.H.P. Vertical Four Stroke National Oil Engine with a V belt driven 2½ K.W. 230 Volts D.C. Generator. The subject of augmenting the power supply was considered by the Board and necessary action taken.

Hedigalla Division:—20 B.H.P. Gardner Single Cylinder Horizontal cold start with a V belt driven 12 K.W. 230 Volts Generator.

The above were maintained in good order. The 80/90 B.H.P. National Engine at Dartonfield was out of commission for approximately a month due to a break-down on 1st October.

Fuel Consumption:

	Average per hour
80/90 B.H.P. National Engine	
Liquid Fuel	2.50 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	3.50 gallons
Lubricating Oil	.50 ,,
20 B.H.P. Gardner Engine (Hedigalla)	
Liquid Fuel	.75 gallons
Lubricating Oil	.06 ,,
5 B.H.P. National Engine (Nivitigalakele)	
Liquid Fuel	.75 gallons
Lubricating Oil	.08 ,,

Factory Machinery:—There were no additions to the factory machinery. All machinery were maintained in good order and motors of two mills were replaced with new units of 25 H.P.

Drying Loft.—The C.C.C. 48" axial flow propeller type fan, which was installed in 1956, proved to be of great use and worked satisfactorily.

6 N.H.P. Vertical Cross Tube Cradley Boiler:—This boiler worked satisfactorily throughout the year.

Smoke-House:—The direct fired Air Heater 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 Howl 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.

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:

Six Double Cottages at Hedigalla:—This work was completed.

Two Asst. Staff Bungalows at Dartonfield:—These are under construction.

Two Cottages for two new Asst. Engine Drivers:—Work given on contract.

Water Seal Latrines:—Two latrines were constructed for use of servants employed in Asst. Staff Bungalows Nos. 14 and 18.

Drying Shed for Botany Department.—This building was completed. Drying apparatus remain to be installed in early 1958.

Extension to Plant Pathology Laboratory:—Work in progress.

Greenhouse:—Not undertaken during the year.

Structural Alterations to I.S. Chummery:—Complete.

One Cottage for K.P. at Nivitigalakele:—Under construction.

Water and Power Supply:—Power supply at Dartonfield was augmented by (1) paralleling one underground cable to another feeding the laboratories, main purpose of which was to accommodate a new Autoclave, and (2) laying an underground cable to feed the Senior Staff Bungalows Nos. 1 and 2.

Water Supply at Hedigalla is being augmented by installing a pumping unit.

Roads at Dartonfield Group:—Work completed.

Estate Equipment:—Equipment as envisaged was purchased effecting savings on all items *viz.* (*a*) 1 Aluminium Latex Transporting Tank, (*b*) 1 Aluminium Coagulum Transporting Tank and (*c*) Two Sulphur Dusting Machines.

Asst. Superintendent's Bungalow at Hedigalla:—Under construction.

Alterations to Board Room and Director's Office:—Completed.

RUBBER REPLANTING SUBSIDY SCHEME NURSERY AT HEDIGALLA:

Superintendence:—The Estate Superintendent, R.R.I.C., paid supervisory visits to this nursery.

Staff:—Mr. H. M. Buultjens was seconded for service as Nursery Manager with effect from 1st January, 1957.

Rainfall:—181.15" as against 168.61" 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, 30 feet apart) leaving a distance of seven feet on either side of the plants.

(*b*) 57 acres of nursery beds on cleared jungle land by the end of the year.

Twenty five acres of jungle was cleared in the course of the year, thereby increasing the total acreage under nursery from 52 acres in 1956 to 77 acres in 1957.

Budwood Nursery:—Advantage was taken to establish a budwood nursery on rocky areas where nursery beds could not be suitably prepared. 3,100 planting points made up of 200 plants of LCB 1320 and 2,900 plants of PB 86 were planted. Material from this budwood nursery would be available in 1958-59.

The nurseries were maintained in good condition throughout the year. Routine weeding, manuring and attention to paths and steps were carried out.

Planting material:—31, 818 PB 86 budded stumps and 201,166 Tjir 1 seedling stumps were issued from this nursery by the Rubber Controller during the course of the year.

GENERAL:

Correspondence:

Inward	...	1,244
Outward	...	1,779

Estimates:—

(*a*) Estimates for 1958 Capital and Revenue Expenditure in respect of Dartonfield Group were prepared and submitted by the writer to the Rubber Research Board.

(*b*) Estimates for 1958 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.

REPORT OF THE CHAIRMAN, RUBBER RESEARCH BOARD.

Board Membership.—The following changes in the membership of the Board occurred during the year:—

Mr. R. H. Wickremasinghe, Deputy Secretary to the Treasury, resumed membership on return from leave with effect from 28th January, relieving Mr. H. S. Amarasinghe who had acted for him.

Mr. G. H. Carter was renominated by the Planters' Association of Ceylon for a further period of three years with effect from 1st April.

On the death of Mr. R. H. Wickremasinghe, Mr. H. E. Peries, Acting Deputy Secretary to the Treasury, was nominated to serve on the Board with effect from 31st May. I wish to take this opportunity of placing on record my appreciation of the very valuable work done by the late Mr. Wickremasinghe as a member of the Board. His long and varied experience in the public service made his contributions to the Board's discussions extremely valuable. His sudden and untimely death was a blow, not only to the Board, but to the entire public service of Ceylon.

Mr. G. H. Carter was on leave from 29th June and Mr. H. St. J. Cole-Bowen acted for him during the rest of the year.

Mr. B. Mahadeva, Rubber Controller, was out of the Island from 22nd July and Mr. A. J. Joseph acted for him until the return of Mr. Mahadeva on 28th September.

Dr. E. D. C. Baptiste, Director, was on leave with effect from 13th September and Mr. C. A. de Silva, Acting Director, served on the Board during the Director's absence.

The personnel of the Board at the end of the year was as follows:—

Ex-Officio Members:—

The Director, R.R.I.C.—Mr. C. A. de Silva, B.Sc.Agr. (London), C.D.A.(Wye) (Acting).
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 Thomas Amarasuriya, 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. Dulling and Mr. H. St. J. Cole-Bowen (Acting).
Representing the Low-Country Products Association—Mr. Errol A. Jayawickreme, J.P., U.M. and Mr. S. Pathmanathan (Chairman).

Meetings of the Board were held on 22nd February, 28th March, 28th May, 15th July, 12th September and 18th November.

Committees:—

Administrative Committee.—The following changes occurred in the membership of the Committee during the year:—

Mr. H. St. J. Cole-Bowen served on the Committee during the absence of Mr. G. H. Carter on leave.

Mr. A. J. Joseph served on the Committee during the absence of Mr. B. Mahadeva, Rubber Controller.

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. H. St. J. Cole-Bowen (Acting)
Mr. W. P. H. Dias
Dr. M. F. Chandraratne
Mr. B. Mahadeva
Mr. G. H. Dulling
Mr. C. A. de Silva (Acting Director)

Meetings of the Committee were held on 13th February, 15th May, 29th June, 6th September and 28th October.

Smallholdings Committee.—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. C. A. de Silva (Acting Director)

A meeting of this Committee was held on 20th December.

Smallholdings Department's Selection Committee.—Mr. B. Mahadeva, Rubber Controller, was included in this Committee and the personnel of the Committee at the end of the year was as follows:—

Mr. W. P. H. Dias
Mr. B. Mahadeva
Mr. C. A. de Silva (Acting Director)
Mr. R. T. Wijewantha (S.H.A.O.)

A meeting of this Commitee was held on 13th February.

Ad hoc Committees:—

Committee appointed to consider the salary terms of Dr. E. D. C. Baptiste, Director.—A Committee consisting of the Chairman, Mr. B. Mahadeva, Mr. R. H. Wickremasinghe and Dr. M. F. Chandraratne was appointed to consider the salary terms of Dr. E. D. C. Baptiste in relation to the incidence of income tax thereon. A meeting of this Committee was held on 25th March.

Committee appointed to consider the memorandum dated 2nd June from the R.R.I.C. Employees' Union and other matters concerning the Union.—A Committee consisting of Mr. S. Pathmanathan, Mr. B. Mahadeva, Mr. H. E. Peries and Dr. M. F. Chandraratne was appointed to consider the memorandum dated 2nd June, 1957, and other matters concerning the Union. A meeting of this Committee was held on 2nd September.

Salaries Committee.—A Committee consisting of Mr. S. Pathmanathan, Mr. V. T. G. Karunaratne, Mr. B. Mahadeva and a Treasury Representative was appointed to review the salary scales and terms of service of the Staff. A meeting of this Committee was held on 14th November.

Liaison with other Organisations:—

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.

Rubber Research Ordinance.—Two amendments to the Rubber Research Ordinance, Amendment Acts No. 8 of 1957 and No. 52 of 1957, were made during the year.

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). Income from this source was more than the estimate for the year by Rs. 32,946/-.

Monthly cess collections were as follows:—

				Brought Forward		Rs.	591,213
January	...	Rs.	79,994	July	...	,,	120,861
February	...	,,	136,196	August	...	,,	25,367
March	...	,,	154,333	September	...	,,	78,038
April	...	,,	27,657	October	...	,,	164,841
May	...	,,	86,365	November	...	,,	84,132
June	...	,,	106,668	December	...	,,	77,294
Carried Forward		Rs.	591,213	Total	...	Rs.	1,141,746

A profit of Rs. 26,100/- was derived from the normal working of Dartonfield Group, and a grant of Rs. 234,864/- was received from Government for Smallholdings work.

Expenditure.—Recurrent expenditure amounted to Rs. 1,367,109/-.

Capital expenditure amounting to Rs. 358,295/- was incurred during the year, the main items being:

Agricultural Development	...	Rs.	207,547
Buildings ...	...	,,	33,648
Laboratory Apparatus	...	,,	52,018

Accounts.—The accounts for the year with a Balance Sheet showing the property and liabilities of the Board have been 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 1956.

No. P-2(3)8.
Audit Office,
Colombo 7,

16th December, 1957.

The Chairman,
Board of Management,
Rubber Research Institute,
Agalawatta.

Accounts of the Rubber Research Institute for the year ended December 31, 1956.

The accounts of the Rubber Research Institute for the year ended December 31, 1956, 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 December 31, 1956, the Capital Account as at December 31, 1956, and the General Balance Sheet as at December 31, 1956;

(*b*) Dartonfield Group Working Account for the year ended December 31, 1956;

(*c*) Provident Fund Working Account for the year ended December 31, 1956; and,

(*d*) Assistant Staff Medical Fund Working Account for the year ended December 31, 1956;

which were rendered for audit in March 1957 had to be returned for amendment and the amended statements were received in audit in October 1957. The following are comments which I consider necessary to offer on these accounts.

REVENUE ACCOUNT

2. **Income.**—The actual income for the year amounting to Rs. 1,467,054.59 was less than the estimated income of Rs. 1,474,920.00 by Rs. 7,865.41 and the actual income for the previous year by Rs. 164,453.57. 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.

(*a*) **Cess Collections—Rs. 1,055,943.37.**—The cess revenue for the year under review was Rs. 1,055,943.37 as compared with Rs. 1,220,675.99 for the previous year. The decrease of Rs. 164,732.62 reflects the decrease in export volume in 1956.

(*b*) **Government Grant for Smallholdings Work Rs. 211,500/-.**—According to the Estimates for 1955-56 of the Government Rs. 226,500.00 was provided under Head 82—Department of Agriculture, Vote 1, Subhead 15, item 'Grant to Rubber Research Institute for Rubber Planting Scheme'. The full provision of Rs. 226,500.00 was paid to the Rubber Research Board by the Director of Agriculture, but only Rs. 211,500.00 has been shown in the Revenue Account under the description, 'Government Grant for Smallholdings Work'. The balance sum of Rs. 15,000/- from the Grant was treated by the Board as an imprest for 'Soil Conservation Work' out of which Rs. 11,253.35 was spent during the year and the unspent balance of Rs. 3,746.65 refunded to the Director of Agriculture. Under the accounting procedure adopted, neither the receipt of the Rs. 15,000.00 nor the expenditure on Soil Conservation Work referred to above are shown in these accounts. The necessity for refunding the unspent portion of the grant is also not clear and is under query in audit.

The present method of merging the Government Grant for Replanting Work and the expenditure therefrom in the Income and Expenditure Account of the Institute does not appear to be satisfactory as the position with regard to the utilisation of this Government Grant given for a specific purpose is not readily ascertainable. It is, therefore, suggested that in future a separate statement be furnished in respect of this grant showing the amount of grant received in each year, the expenditure therefrom and the balance, if any, remaining unspent at the end of the year.

3. Revenue Expenditure—Rs. 1,391,685.29.—The total expenditure amounted to Rs. 1,391,685.29 as compared with Rs. 1,122,067.97 for the previous year. The estimated and the actual expenditure and the reasons for variation are shown in the statement marked 'B'. The expenditure in respect of several items exceeded the sanctioned estimates by a total sum of Rs. 37,630.05, as indicated in that statement.

It is suggested that the Board's covering approval be obtained for all the excesses.

4. **Contribution to London Advisory Committee and British Rubber Producers' Research Association Rs. 154,666.67.**—Included in this sum is Rs. 150,000.00 being the annual contribution payable by Ceylon to the British Rubber Producers' Research Association. Prior to the year 1955 this contribution was met from the funds of the Rubber Controller, but during 1955 and 1956 it was paid by the Rubber Research Board at the request of the Rubber Controller owing to a temporary shortage of money in the Rubber Control Fund. The contribution for 1957 has again been met from Rubber Control Funds.

CAPITAL ACCOUNT

5. **Register of Fixed Assets.**—A register of fixed assets giving details of items, date of acquisition, cost, depreciation written off, etc. was not maintained though this omission was pointed out in the Audit Report for 1955. In addition to maintaining a register of fixed assets it is also necessary to have these assets verified by a Board of Survey at the end of the year so as to furnish evidence of their existence on the date of the Balance Sheet.

6. **Dartonfield Group Working Account.**—The working account of the Dartonfield Group showed a profit of Rs. 80,116.48 which is less than the previous year's profit of Rs. 104,099.81 by Rs. 23,983.33. The decrease in profits was attributable mainly to a drop of 31 cts. per lb. in the average selling price from Rs. 1.45 per lb. in 1955 to Rs. 1.14 per lb. in 1956.

7. (*a*) **General Charges Rs. 49,451.21.**—These had been allocated up to 1955 as follows :

Head Office (Revenue Account)	...	46%
Dartonfield Group		
(*a*) Working Account (*b*) Capital Account	...	54%—Distributed between (*a*) and (*b*) on an acreage basis.

In the year under review the basis of allocation has been revised as follows:—

Head Office (Revenue Account)	...	25% of Superintendent's salary and his office staff and 50% of Apothecary's salary and Dispensary Staff.
Dartonfield Group		
(*a*) Working Account (*b*) Capital Account	...	Balance of all other General Charges distributed on basis of labour employed.

(*b*) **Payment of Wages to Labourers.**—The wages paid to some of the labourers which were found to be in excess of the minimum rates prescribed under the Wages Board Ordinance were queried in audit. The Board at its meeting held on 21-5-56, while noting that the increases had been paid by the Superintendent at his discretion to deserving labourers, expressed the view that "it was a bad policy for a labourer's wages to be increased as it would be difficult to decrease it later if his duties are changed", and decided that in cases where labourers had been in receipt of wages in excess of the minimum prescribed under the Wages Board Ordinance, such excesses should be paid to them as an 'incentive bonus'.

The decision of the Board has, however, not been implemented in that the check rolls continue to show these excessive rates of wages as the rates applicable to the labourers without showing the excess above the minimum Wages Board rates as an 'incentive bonus'.

(*c*) **Sale of Produce, Manufactured Rubber Rs. 247,582.77.**—The above amount represents the net proceeds of sale after deduction of brokerage, commission, etc. It is desirable to show how the net proceeds were arrived at by an inset, *e.g.*

Gross Proceeds	.....	Rs.....
Less: Brokerage	.....	.....
Commission	.....	.....Rs. 247,582.77

BALANCE SHEET

8. **Assets: Net Expenditure on Nurseries Rs. 33,413 50.**—This amount represents the net expenditure incurred on establishment and upkeep of nurseries, after deducting therefrom the proceeds of sale of planting materials

obtained from them. It is not very appropriate to group these items under 'Payments in Advance' and might preferably be shown as a separate item entitled 'Nurseries Advance Account'.

9. **Estate Stock.**—(*a*) The stock in hand at December 31, 1956, comprised the following as certified by the Estate Superintendent:—

(i)	Materials	Rs.	22,701.56
(ii)	Rice and Foodstuffs ...	,,	1,461.04
		Rs.	24,162.60

The value of the following items, however, which were in stock on December 31, 1956, was not included in the above figure:—

(i) 9 Gallons of lubricating oil,

(ii) 25 chests of sole crepe,

(iii) 552 sq. ft. of timber.

(*b*) Rs. 24,162.60 shown as the value of stock includes the value of 44 gallons of (R.P.M. Delv. S.A.E. 30) oil although the actual stock of this oil on December 31, 1956, was only 24 gallons. The value of the extra 20 gallons of oil, has, by an error, been included in the above figure.

10. **Investments—Rs. 2,863,150.00.**—This amount represents the total cost price of the investments whose face value was Rs. 2,865,000/- and Middle Market value as at December 31, 1956, stood at Rs. 2,827,772.50.

11. **Liabilities: Loan from the Rubber Controller Rs. 25,000/-.**—The above loan was given by the Rubber Controller for the purchase of Sulphur Dusting Machines and is to be repaid when the increased cess which had been proposed became effective.

Sgd. D. S. DE SILVA,

for Auditor General.

RUBBER RESEARCH INSTITUTE OF CEYLON

Dr. **REVENUE ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1956.** **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.
To Administration of the Board:—			By Cess Collections	1,055,943.37
Travelling Expenses of Board Members	1,664.50		„ Government Grant for Smallholdings Work	211,500.00
Entertainment of Board Members ...	30.65		„ Payment by the Rubber Controller from Rubber Subsidy Scheme Fund ...	27,213.18
		1,695.15	„ Interest	86,854.73
„ Personal Emoluments:—			„ Sale of Publications	2,674.17
Senior Scientific Staff	176,001.79		„ Profit from Dartonfield Group ...	80,116.48
Junior Scientific Staff	49,668.55		„ Sundry Receipts	2,752.66
Office Staff	46,740.39			
		272,410.73		
„ Library and Publications:—				
Library	6,394.30			
Publications	6,667.27			
		13,061.57		
„ Smallholdings Work:—				
Emoluments of Staff (S.H.)	253,103.83			
Travelling and General Expenses (S.H.)	80,748.97			
		333,852.80		
„ Laboratory:—				
Equipment and Working Expenses ...	40,072.15			
Furniture Replacements	114.56			
		40,186.71		
„ Field and Factory Experiments:—				
Field Experiments	39,581.95			
Factory Experiments	30,469.27			
		70,051.22		
„ Office:—				
Stationery and Office Equipment ...	4,685.52			
Postages and Telegrams	3,037.86			
Advertising	2,130.02			
Telephone	1,646.25			
Audit	4,248.05			
		15,747.70		
„ Travelling:—				
Travelling Expenses of Staff		29,337.31		
Carried Forward		776,343.19	Carried Forward	1,467,054.59

Dr. **REVENUE ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1956—(*Contd.*)** **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.
Brought Forward		776,343.19	Brought Forward	1,467,054.59
To MAINTENANCE OF BUILDINGS, POWER AND WATER SUPPLY AND MOTOR VEHICLES:—				
Maintenance of General Buildings ...	3,182.57			
,, ,, Bungalows	9,713.79			
,, ,, Water and Power Supply	38,916.37			
Bungalow Furniture Replacements ...	1,710.47			
Maintenance of Motor Vehicles ...	4,819.58			
		58,342.78		
,, MISCELLANEOUS ITEMS SHARED WITH ESTATE:—				
Dartonfield Group General Charges ...	11,332.68			
Upkeep of Building Premises	7,933.80			
Factory Upkeep	4,789.09			
		24,055.57		
,, OTHER CHARGES:—				
Contributions to L.A.C. and B.R.P.R.A.	154,666.67			
Contingencies	1,902.72			
Insurance Charges	10,463.81			
Staff Provident Fund	94,354.40			
Passages	15,000.00			
Entertainment Allowance	422.00			
Dearness Allowance to Staff	109,694.52			
Contribution to Asst. Staff Medical Fund	4,216.65			
Contribution to Senior Staff Medical Scheme	2,341.47			
Social Services	2,015.11			
Depreciation	106,444.31			
Expenses on Royal Agricultural and Food Exhibition	4,109.49			
Establishment and Upkeep of Nurseries	6,509.39			
Renovations and Repairs	20,803.21			
		532,943.75		
Excess of Income over Expenditure carried to Balance Sheet		75,369.30		
	Rs.	1,467,054.59	Rs.	1,467,054.59

RUBBER RESEARCH INSTITUTE OF CEYLON

CAPITAL ACCOUNT AS AT 31ST DECEMBER, 1956.

EXPENDITURE

	To December 31st 1955 Rs. Cts.	Transfers Between A/cs. Rs. Cts.	Additions in 1956 Rs. Cts.	Total Rs. Cts.
To Land Including Development:—				
Dartonfield	354,148.51		32,150.36	386,298.87
Nivitigalakele ...	196,241.45		6,116.10	202,357.55
Hedigalla	882,633.96		220,852.59	1,103,486.55
„ Buildings and Lines:—				
Dartonfield				
Estate	224,171.03		—	224,171.03
Headquarters ...	758,237.29		6,544.03	764,781.32
Nivitigalakele				
Estate	47,124.96		—	47,124.96
Headquarters ...	25,112.33		—	25,112.33
Hedigalla				
Estate	270,858.47		1,938.04	272,796.51
Headquarters ...	34,762.61		5,646.90	40,409.51
„ Furniture and Fixed Equipment:—				
Dartonfield	153,290.57		5,032.54	158,323.11
Nivitigalakele ...	5,733.70		—	5,733.70
Hedigalla	4,628.71		—	4,628.71
„ Power and Water Supply:—				
Dartonfield	166,265.75		176.48	166,442.23
Nivitigalakele ...	7,880.48		—	7,880.48
Hedigalla	20,142.89		6,624.90	26,767.79
„ Machinery and Tools:—				
Dartonfield	563,262.29		31,972.55	595,234.84
Nivitigalakele ...	4,754.23		—	4,754.23
Hedigalla	19,427.68		—	19,427.68
„ Laboratory Apparatus:—	190,838.07		66,907.48	257,745.55
„ Motor Vehicles ...	61,442.35	Cr. 12,007.50	18,590.00	68,024.85
	3,990,957.33	Cr. 12,007.50	402,551.97	4,381,501.80

RECEIPTS

	Rs. Cts.
By Revenue applied for Capital purposes at 31st December, 1955	3,990,957.33
Less Disposals	12,007.50
	3,978,949.83
Additions in 1956	402,551.97
Rs.	4,381,501.80

RUBBER RESEARCH INSTITUTE OF CEYLON

GENERAL BALANCE SHEET AS AT 31ST DECEMBER, 1956.

LIABILITIES	Rs. Cts.	Rs. Cts.	ASSETS	Rs. Cts.	Rs. Cts.
CREDITORS:—			DEBTORS:—		
Sundries	104,300.92		Cess Collections for November and December, 1956	182,268.28	
Receipts in Advance	194,471.90		Sundries	66,303.58	
Loan from Rubber Controller	25,000.00		Accrued Interest on Investments ...	22,475.65	
Security Deposits	4,000.00				271,047.51
		327,772.82	ADVANCE ACCOUNT:—		
PASSAGE FUND RESERVE:—			Estate Superintendent	26,631.53	
At December 31, 1955	37,879.20		Smallholdings Advisory Officer:		
Add Reserve for 1956	15,000.00		General Account ... Rs. 2,341.00		
	52,879.20		Soil Conservation A/c. ,, 1,219.91		
Less Payments in 1956	13,792.55			3,560.91	
		39,086.65	London Advisory Committee ...	19,122.58	
DEPRECIATION RESERVE:—			Postmaster General	160.00	
At December 31, 1955	602,645.86				49,475.02
Add Reserve for 1956	106,444.31		PAYMENTS IN ADVANCE:—		
	709,909.17		Sundries	25,761.64	
Less Payments in 1956	8,072.87		Net Expenditure on Nurseries	33,413.50	
		701,017.30			59,175.14
PROVIDENT FUND RESERVE:—			STOCK:—		
At December 31, 1955	593,862.82		Estate Stock		24,162.60
Additions during 1956	171,046.78		LOANS:—		
	764,909.60		For purchase of Transport		49,990.16
Less Payments in 1956	59,767.77	705,141.83	For purchase of Cookers		2,342.68
AUDIT FEE RESERVE:—		4,248.05			
MEDICAL FUND:—					
At December 31, 1955	34,753.65				
Additions during 1956	12,269.41				
	47,023.06				
Less Payments in 1956	10,362.25				
		36,660.81			
Carried Forward		1,813,927.46	Carried Forward		456,193.11

GENERAL BALANCE SHEET AS AT 31ST DECEMBER, 1956—(*Contd.*)

LIABILITIES	Rs. Cts.	Rs. Cts.	ASSETS	Rs. Cts.	Rs. Cts.
Brought Forward		1,813,927.46	Brought Forward		456,193.11
RESERVE FOR STABILISATION OF INCOME:—			INVESTMENTS:—		
At December 31, 1955	1,000,000.00		In Ceylon Govt. 3½% loan 1957/62 ...	25,000.00	
Additions in 1956	—		—Do— 3% War loan 1956/60 ...	20,000.00	
		1,000,000.00	—Do— 3½% National loan 1964/69	70,000.00	
SURPLUS ACCOUNT:—			—Do— 3% Sri Lanka Loan 1969/74	750,000.00	
At December 31, 1955	1,143,373.63		—Do— 3% Loan 1973/78 ...	600,000.00	
Add Depreciation written off and value of Asset sold	9,957.87		—Do— 3% Loan 1966/71 ...	500,000.00	
	1,153,331.50		—Do— 3% Loan 1969/72 ...	250,000.00	
Less Audit fee for 1955 paid in 1956 ...	5,735.35		—Do— 3% Loan 1972/77 ...	500,000.00	
	1,147,596.15		3¼% Ceylon State Mortgage Bank Debentures	148,150.00	
Add Excess of Income over Expenditure for 1956	75,369.30				2,863,150.00
	1,222,965.45		CASH BALANCES:—		
Less: Contributions to Capital outlay ...	402,551.97		At Ceylon Savings Bank		4,567.39
		820,413.48	In Savings Deposit (Bank of Ceylon) ...		9,874.17
			In Fixed Deposit (Bank of Ceylon) ...		4,000.00
			In Current Account (Bank of Ceylon) ...		296,268.14
			In hand		288.13
Rs.		3,634,340.94	Rs.		3,634,340.94

The accounts of the Rubber Research Institute for the year ended December 31, 1956, have been audited under my direction. Subject to the observations in the accompanying report, No. P-2(3)8 of 16-12-57, 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 December 31, 1956 and the results of its operation for the year ended on that date.

Audit Office,
Colombo-7: 16th December, 1957.

Sgd. D. S. DE SILVA,
for Auditor General.

RUBBER RESEARCH INSTITUTE OF CEYLON

VALUATION OF INVESTMENTS AS AT 31-12-1956.

		Cost		Present Market Value
		Rs. Cts.		Rs. Cts.
Ceylon Government 3½% Loan 1957/62	...	25,000.00	@ 104 3/8	26,093.75
—Do— 3% War Loan 1956/60	...	20,000.00	@ 101 13/16	20,362.50
—Do— 3½% National Loan 1964/69	...	70,000.00	@ 105 7/16	73,806.25
—Do— 3% Sri Lanka Loan 1969/74	...	750,000.00	@ 98 11/16	740,156.25
—Do— 3% Loan 1973/78	...	600,000.00	@ 96 3/4	580,500.00
—Do— 3% Loan 1966/71	...	500,000.00	@ 100	500,000.00
—Do— 3% Loan 1969/72	...	250,000.00	@ 100	250,000.00
—Do— 3% Loan 1972/77	...	500,000.00	@ 97	485,000.00
State Mortgage Bank 3¼% Debentures	...	148,150.00	@ 51 1/4	151,853.75
		Rs. 2,863,150.00		Rs. 2,827,772.50

DARTONFIELD GROUP

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1956** **Cr.**

To Expenditure:—	Rs. Cts.	Rs. Cts.	By Sale of Produce:—	Rs. Cts.
General Charges	49,451.21		Manufactured Rubber 205,866 lbs. ...	247,582.77
Upkeep, Manufacture and Distribution ...	118,440.83	167,892.04	,, Sundry Income	425.75
,, Balance being excess of Income over Expenditure transferred to Revenue Account		80,116.48		
Rs.		248,008.52	Rs.	248,008.52

PROVIDENT FUND

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1956.** **Cr.**

	Rs. Cts.		Rs. Cts.
To Payment to 12 retiring officers ...	59,767.77	By Balance brought forward from 1955 ...	593,862.82
,, Balance carried forward to 1957 ...	705,141.83	,, Board's bonus for 1956	68,000.36
		,, Interest on officers' contributions ...	13,208.64
		,, Interest on Board's bonus	13,985.70
		,, Bonus for 2 retiring officers	7,602.12
		,, Interest for 1956 to 8 retiring officers ...	287.82
		,, Officers' contributions during 1956 ...	67,962.14
Rs.	764,909.60	Rs.	764,909.60

ASSISTANT STAFF MEDICAL FUND

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31ST DECEMBER, 1956.** **Cr.**

	Rs. Cts.		Rs. Cts.
To Refund of medical expenses	9,399.48	By Balance brought forward from 1955 ...	34,753.65
,, Refund of balances to 5 retiring officers	618.62	,, Board's contribution for 1956 ...	5,683.11
,, Loans to 4 officers during 1956 ...	539.15	,, Officers' contributions for 1956 ...	5,681.17
,, Balance carried forward to 1957 ...	36,660.81	,, Loan instalments recovered in 1956 ...	1,100.13
Rs.	47,218.06	Rs.	47,218.06

ESTIMATE AND ACTUAL INCOME STATEMENT FOR — 1956.

	Estimate	Actual Income	Excess	Deficit	Remarks
	Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.	
Cess Collections	1,108,800.00	1,055,943.37	—	52,856.63	Over Estimate
Government Grant for Smallholdings Work ...	231,500.00	238,713.18	7,213.18	—	Grant from Rubber Controller for staff employed for R.R.S. Scheme.
Interest	88,200.00	86,854.73	—	1,345.27	Compulsory redemption of Debentures.
Sale of Publications	3,000.00	2,674.17	—	325.83	—
Dartonfield Group Working	38,144.00	80,116.48	41,972–48	—	Increased crop and better sale prices for Rubber.
Sundry Receipts	5,276.00	2,752.66	—	2,523.34	Over Estimate.

RUBBER RESEARCH INSTITUTE OF CEYLON

STATEMENT OF EXCESSES AND SAVINGS ON VOTES — 1956.

Head of Estimate	Account	Estimate	Expenditure		Excesses	Savings	Remarks
			Capital	Revenue			
		Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.	
1.	**Administration of the Board:—**						
	A. Travelling Expenses of Board Members ...	6,000.00		1,664.50		4,335.50	Over Estimate.
	B. Entertainment of Board Members ...	250.00		30.65		219.35	Over Estimate.
2.	**Emoluments of Senior Scientific Staff:—**	158,690.00		176,001.79	17,311.79		Increased salary of new Director and 5 months leave pay to previous Director.
3.	**Emoluments of Junior Scientific Staff:—**	49,550.00		49,668.55	118.55		—
4.	**Library and Publications:—**						—
	A. Library	6,000.00		6,394.30	394.30		
	B. Publications	10,000.00		6,667.27		3,332.73	3rd and 4th Quarterly Circulars for 1956 not printed until 1957.
5.	**Smallholdings Work:—**						
	A. F and H Emoluments of Staff ...	261,950.00		253,103.83		8,846.17	Changes in Staff.
	B. I and J Travelling and General Expenses	94,990.00		80,748.97		14,241.03	Over Estimate.
6.	**Laboratory:—**						
	A. Equipment and Working Expenses ...	38,000.00		40,072.15	2,072.15		Freight Charges under estimated.
	B. Furniture Replacements	600.00		114.56		485.44	Economies.
7.	**Field and Factory Experiments:—**						
	A. Field Experiments	37,625.00		39,581.95	1,956.95		Under Estimate—Increase of work after new Plant Patho's arrival.
	B. Factory Experiments	48,530.00		30,469.27		18,060.73	Economies *re* power.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES — 1956 (*Contd.*)

	Head of Estimate	Account	Estimate	Expenditure				Remarks
				Capital	Revenue	Excesses	Savings	
			Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.	
8.	**Office:—**							
	A-C. Emoluments of Office Staff	...	47,100.00		46,740.39		359.61	Changes in Staff.
	D. Stationery and Office Equipment	...	7,500.00		4,685.52		2,814.48	Economies
	E. Postages and Telegrams	...	4,500.00		3,037.86		1,462.14	—do—
	F. Advertising ...	...	2,500.00		2,130.02		369.98	—do—
	G. Telephone ...	...	1,500.00		1,646.25	146.25		—
	H. Audit	...	4,700.00		4,248.05		451.95	—
9.	**Travelling Expenses of Staff:—**	...	24,000.00		29,337.31	5,337.31		Increased travelling undertaken.
10.	**Maintenance Charges:—**							
	A. General Buildings ...	...	3,200.00		3,182.57		17.43	—
	B. Bungalows	...	8,205.00		9,713.79	1,508.79	—	Under Estimate.
	C. Water and Power Supply ...	...	33,300.00		38,916.37	5,616.37	—	Under Estimate.
	D. Bungalow Furniture ...	...	1,500.00		1,710.47	210.47	—	More repairs and replacements than anticipated.
	E. Motor Vehicles ...	...	17,390.00		4,819.58		12,570.42	More credits from Egaloya and H'galla nurseries and also from D'field Group compared with less expenditure on repairs due to disposal of old vehicles.
11.	**Miscellaneous Items shared with Estate:—**							
	A. Dartonfield Group General Charges	...	12,550.00		11,332.68		1,217.32	Economies
	B. Upkeep of Building Premises	...	10,100.00		7,933.80		2,166.20	—do—
	C. Factory Upkeep ...	...	7,890.00		4,789.09		3,100.91	—do—
12.	**Other Charges:—**							
	A & B. Contributions to L.A.C. and B.R.P.R.A. ...	...	154,800.00		154,666.67		133.33	Difference in Exchange.
	C. Contingencies ...	...	1,500.00		1,902.72	402.72		Lawyers' fees and stamps on contracts of two officers going on scholarship.
	D. Insurance ...	...	13,200.00		10,463.81		2,736.19	Building programme not completed
	E. Staff Provident Fund ...	...	91,800.00		94,354.40	2,554.40		Staff Changes.
	F. Passages ...	...	15,000.00		15,000.00	—	—	—
	G. Entertainment Allowance	...	500.00		422.00	—	78.00	Less Visitors.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES — 1956 (*Contd*)

	Head of Estimate Account	Estimate	Expenditure				Remarks
			Capital	Revenue	Excesses	Savings	
		Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.	
12.	**Other Charges** (*Contd*) :—						
	H. Dearness Allowance to Staff ...	111,400.00		109,694.52		1,705.48	Staff changes.
	I. Assistant Staff Medical Fund ...	7,500.00		4,216.65		3,283.35	Less Claims
	J. Senior Staff Medical Scheme ...	3,000.00		2,341.47		658.53	—do—
	K. Social Services	2,200.00		2,015.11		184.89	Economies
	L. Expenses of Agricultural and Food Exhn.	5,000.00		4,109.49		890.51	—do—
13.	**Depreciation:**—	119,900.00		106,444.31		13,455.69	Non completion of 1955 building programme and non purchase of certain equipment
14.	**Renovation and Repairs:**— ...	24,105.00		20,803.21		3,301.79	Economies
15.	**Establishment and Upkeep of Nurseries:**—	7,960.00		6,509.39		1,450.61	—do—
16.	**Capital Account:**—						
	A. Retaining wall below Botany Labs. ...	3,600.00	2,462.20			1,137.80	—do—
	B. 71 Acres at H'galla (1956) new clearing ...	76,186.00	65,694.31			10,491.69	11 acres out of the 71 acres not planted due to rock etc.
	C. 80 Acres at H'galla (1957) ,, ,, ...	16,744.00	4,920.00			11,824.00	Only felling was completed on 41 acres
	D. Replanting 4¾ Acres (D'field) ...	3,461.00	3,630.14		169.14		
	E. Upkeep of Immature areas (D'field Gr.) ...	191,684.00	173,093.45			18,590.55	Economies
	F. Store for Agronomist	4,000.00	3,989.48			10.52	
	G. One Asst. Staff B'low at H'galla ...	18,162.00	—			18,162.00	Work not undertaken
	H. Six Double cottages for Labourers at Hedigalla and 1 Double Unit Quarters for Minor Staff	34,718.00	6,500.00			28,218.00	Work not completed
	I. Temple for Labourers at Hedigalla ...	250.00	—			250.00	Work not undertaken
	J. One manure shed and one sulphur shed ...	3,600.00	3,511.76			88.24	Economies.
	K. Extension of Coagulating Shed ...	2,600.00	2,456.40			143.60	—do—
	L. Roads at Dartonfield Group ...	18,300.00	4,816.52			13,483.48	Hedigalla roads not completed.
	M. One Peugeot station waggon ...	12,000.00	12,000.00			—	—
	N. Equipment for Agronomist ...	17,000.00	16,831.50			168.50	Payments not completed.
	O. ,, for Botanist ...	3,350.00	2,834.94			515.06	—do—
	P. ,, for Chemist ...	35,782.00	33,312.68			2,469.32	—do—
	Q. ,, for Plant Pathologist ...	12,100.00	13,928.36		1,828.36		Under Estimate.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES — 1956 (*Contd.*)

Head of Estimate	Account	Estimate	Expenditure		Excesses	Savings	Remarks
		Rs. Cts.	Capital Rs. Cts.	Revenue Rs. Cts.	Rs. Cts.	Rs. Cts.	
16.	**Capital Account** (*Contd.*) :—						
	R. Furniture and Fixed Equipment ...	5,063.00	5,032.54			30.46	
	S. Clearing 5 acres Jungle at Hedigalla ...	600.00	—			600.00	Work not undertaken.
	T. Eradicating Coffee plantation at Hedigalla	350.00	343.68			6.32	
	U. Fans for Senior Staff B'lows and Agronomy Dept.	2,000.00	2,191.03		191.03		
	V. One Asst. Superintendent's B'low at Hedigalla	25,000.00				25,000.00	Work not undertaken.
	1. Experimental alteration or additions to existing units	22,000.00	24,372.55		2,372.55		Increased cost of installing experimental mills.
	2. Asst. Staff Bungalow at Hedigalla (1955)	457.00	385.98			71.02	
	3. Water and Power Supply	31,000.00	6,624.90			24,375.10	Work not completed.
	4. 3 Single Water Seal Latrines at Dartonfield	525.00	540.00		15.00		
	5. One Station Waggon for Hedigalla ...	865.00	1,090.00		225.00		Under Estimate.

ESTIMATES FOR 1958.

(Adopted by the Board, 12th September, 1957)

Estimate of Income for 1958.

1.	Cess Collections	Rs.	1,663,200
2.	Government Grant for Smallholdings work ...	,,	281,500
3.	Interest	,,	88,250
4.	Sale of Publications	,,	4,000
5.	Profit from Dartonfield Group Working ...	,,	11,041
6.	Sundry Receipts	,,	3,000
		Rs.	2,050,991

ESTIMATE OF EXPENDITURE FOR 1958

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.	201,344		
	(*b*) Junior Scientific Staff ...	,,	79,526		
				Rs.	280,870
3.	**Library and Publications:—**				
	(*a*) Library	Rs.	13,280		
	(*b*) Publications	,,	10,000		
				Rs.	23,280
4.	**Smallholdings Department:—**				
	(*a*) Salaries and Allowances ...	Rs.	325,388		
	(*b*) Travelling and General Expenses	,,	124,295		
	(*c*) Sulphur Dusting Scheme 1957/58	,,	42,857		
				Rs.	492,540
5.	**Laboratory:—**				
	(*a*) Equipment and Working Expenses	Rs.	45,790		
	(*b*) Furniture Replacements ...	,,	600		
				Rs.	46,390
	Carried Forward			Rs.	848,330

	Brought Forward		Rs.	848,330
6.	**Field and Factory Experiments:—**			
	(*a*) Field Experiments ...	Rs. 50,130		
	(*b*) Factory Experiments ...	,, 57,085	Rs.	107,215
7.	**Office:—**			
	(*a*) Salaries of Office Staff ...	Rs. 56,712		
	(*b*) Stationery and Office Equipment	,, 9,000		
	(*c*) Postages and Telegrams ...	,, 5,000		
	(*d*) Advertising	,, 2,500		
	(*e*) Telephone	,, 1,500		
	(*f*) Audit	,, 4,500	Rs.	79,212
8.	**Travelling Expenses of Staff:—**			
	Officers' Expenses		Rs.	60,000
9.	**Maintenance Charges:—**			
	(*a*) General Buildings ...	Rs. 4,264		
	(*b*) Bungalows	,, 11,200		
	(*c*) Water and Power Supply ...	,, 54,116		
	(*d*) Furniture	,, 2,500		
	(*e*) Motor Vehicles	,, 25,157	Rs.	97,237
10.	**Miscellaneous items shared with Estate:—**			
	(*a*) Dartonfield Group General Charges	Rs. 42,587		
	(*b*) Upkeep of Building Premises ...	,, 13,920		
	(*c*) Factory Upkeep	,, 8,520	Rs.	65,027
11.	**Other Charges:—**			
	(*a*) Contribution to London Advisory Committee	Rs. 4,800		
	(*b*) Contingencies	,, 1,500		
	(*c*) Insurance Charges ...	,, 17,650		
	(*d*) Staff Provident Fund ...	,, 119,600		
	(*e*) Passages	,, 20,500		
	(*f*) Entertainment Allowance ...	,, 1,500		
	(*g*) Dearness Allowance to Staff ...	,, 142,675		
	(*h*) Assistant Staff Medical Fund ...	,, 8,525		
	(*i*) Senior Staff Medical Scheme ...	,, 3,500		
	(*j*) Social Services	,, 2,200	Rs.	322,450
	Carried Forward		Rs.	1,579,471

	Brought Forward		Rs.	1,579,471
12.	**Depreciation**		Rs.	125,775
13.	**Renovations and Replacements** ...		,,	15,975
14.	**Establishment and Upkeep of Nurseries** ...		,,	11,052
	TOTAL ...		Rs.	1,732,273

CAPITAL EXPENDITURE FOR 1958

1.	**Agricultural Development**		Rs.	190,105
2.	**Buildings**		,,	453,480
3.	**Equipment**		,,	245,760
4.	**Vehicles**		,,	50,245
5.	**Roads**		,,	3,580
6.	**Water and Power Supply**		,,	9,570
7.	**General**		,,	11,700
			Rs.	964,440

SUMMARY

Income			Rs.	2,050,991
Expenditure:—				
Recurrent	Rs. 1,732,273			
Capital	,, 964,440			
			Rs.	2,696,713
Excess of Expenditure over Income			Rs.	645,722

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