Report of the Work of The Rubber Research Board in 1955.

The present report is the twenty fifth 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 and No. 3 of 1955.

CHAIRMAN'S REPORT

Board Membership.—The following changes in the membership of the Board occurred during the year:—

The three-year period of membership of Messrs. W. P. H. Dias and W. Herbert de Silva terminated on 21st January; Messrs. S. Pathmanathan and Errol A. Jayawickrame were appointed in their place.

Gate Muhandiram Arthur D. S. Jayasingha's three-year period of membership terminated and Mr. W. P. H. Dias was appointed in his place with effect from 1st February.

Mr. R. H. Wickramasinghe, Deputy Secretary to the Treasury, was appointed with effect from 19th January in place of Mr. W. D. Gunaratna, Acting Deputy Secretary to the Treasury.

Mr. G. H. Dulling resumed membership on return from leave with effect from 15th February, relieving Mr. H. Creighton who had acted for him.

Mr. G. H. Carter was on leave from 1st April and Mr. H. St. J. Cole-Bowen acted for him until the end of the year.

Senator C. F. W. Wickramasinghe was renominated for a further period of three years on the termination of his term of office on 21st July.

Dr. A. W. R. Joachim, Director of Agriculture, was on leave from 1st October and Dr. W. R. C. Paul, Acting Director of Agriculture, acted for him.

Mr. R. H. Wickramasinghe, Deputy Secretary to the Treasury, was on leave from 16th September and Mr. W. J. A. Van Langenberg, Acting Deputy Secretary to the Treasury, acted for him until 30th October.

Mr. B. Mahadeva, Rubber Controller, was on leave from 6th October until 17th November and Mr. D. C. L. Amarasinghe, Acting Rubber Controller, acted for him during this period.

On the resignation of Dr. H. E. Young, Director, from the Institute's service, Mr. C. A. de Silva, Acting Director, served on the Board with effect from 6th October.

Senator Thomas Amarasuriya, O.B.E., was nominated to represent the Senate for a period of three years from 7th November in place of Senator C. F. W. Wickramasinghe.

The writer was elected Chairman of the Board with effect from 2nd February and Dr. H. E. Young, Vice-Chairman, officiated as Chairman from 21st January until 1st February.

The personnel of the Board at the end of 1955 was as follows:—

Ex-Officio Members:—

The Acting Director, R.R.I.C.—Mr. C. A. de Silva, B.SC., C.D.A.

The Acting Director of Agriculture—Dr. W. R. C. Paul, PH.D., M.SC.

The Deputy Secretary to the Treasury—Mr. R. H. Wickramasinghe, M.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—Major T. F. Jayawardene, 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.

Representing the Low-Country Products Association—Mr. Errol A. Jayawickrame, J.P., U.M. and Mr. S. Pathmanathan (Chairman).

Meetings of the Board were held on 17th January, 2nd February, 16th March, 18th May, 17th August, 12th September, 22nd September, 24th October and 21st December.

Committees:—

Experimental Committee.—The following changes occurred in the membership of the Committee during the year:—

Mr. S. Pathmanathan was nominated to the Committee in place of Gate-Muhandiram Arthur D. S. Jayasinghe.

Mr. H. Cole-Bowen served on the Committee during the absence of Mr. G. H. Carter.

The personnel of the Committee at the end of the year was as follows:—

Mr. S. Pathmanathan (Chairman)
Mr. H. St. J. Cole-Bowen
Mr. G. H. Dulling
Mr. W. P. H. Dias, J.P.
Dr. W. R. C. Paul
Mr. B. Mahadeva
Mr. C. A. de Silva (Acting Director)

The designation of the Committee was changed to Administrative Committee on 17th August. Meetings of the Committee were held on 26th April, 4th August, 22nd September and 1st December.

Smallholdings Committee.—Mr. S. Pathmanathan was nominated to the Committee in place of Gate Muhandiram Arthur D. S. Jayasinghe.

The personnel of the Committee at the end of the year was as follows:—

Mr. S. Pathmanathan (Chairman)
Mr. W. P. H. Dias, J.P.
Mr. C. A. de Silva (Acting Director)

Meetings of the Committee were held on 11th, 19th and 20th July.

Ad hoc Committees:—

Selection Committee.—A Committee consisting of the Chairman of the Board, the Director, Mr. G. H. Carter and Mr. G. H. Dulling was appointed to consider the applications for the post of Estate Superintendent and make a recommendation to the Board. The Committee interviewed selected applicants on 16th March.

Liaison with other Organisations:—

British Rubber Producers' Research Association.—The Board paid the Ceylon Government's contribution to the British Rubber Producers' Research Association in connection with the maintenance of research work on the quality and utilisation of raw rubber.

London Advisory Committee for Rubber Research (Ceylon and Malaya).—The Board contributed jointly with the Rubber Research Institute of Malaya to the London Advisory Committee for the maintenance of the advisory services rendered by its Agricultural Sub-Committee.

FINANCE

Income.—The Board's main income was derived from the cess on exports of rubber under Section 6(1)a of the Rubber Research Ordinance (Cap. 302). Income from this source exceeded the estimate by Rs. 111,875.

Monthly cess collections were as follows:—

January	...	Rs.	161,677	Brought Forward		Rs.	600,043
February	...	,,	85,222	July	...	,,	52,899
March	...	,,	87,713	August	...	,,	57,143
April	...	,,	59,734	September	...	,,	93,441
May	...	,,	99,711	October	...	,,	144,283
June	...	,,	105,986	November	...	,,	166,995
				December	...	,,	105,871
Carried Forward		Rs.	600,043				
				TOTAL		Rs.	1,220,675

A profit of Rs. 104,099.81 was derived from the normal working of Dartonfield Group, and a grant of Rs. 211,500 was received from Government for Smallholdings work.

Expenditure.—Recurrent expenditure amounted to Rs. 1,224,572.05. The surplus of income over expenditure for the year was Rs. 406,648.55.

Capital expenditure amounting to Rs. 416,446.09 was incurred during the year, the main items being:

Agricultural Development ...	...	Rs.	238,533.43
Buildings ...	...	,,	97,888.19
Furniture and Fixed Equipment	...	,,	13,583.94
Water and Power Supply ...	...	,,	14,033.24
Machinery and Tools ...	...	,,	12,695.77
Laboratory Apparatus ...	...	,,	27,294.64
Motor Vehicles ...	...	,,	12,416.88

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 Auditors for examination.

Technical Reports.—The Director's report, which embodies the reports of the other officers, is attached.

Sgd. S. PATHMANATHAN,
Chairman of the Board,
Rubber Research Institute of Ceylon.

Dartonfield,
Agalawatta.
19th March, 1956.

DIRECTOR'S REPORT FOR 1955

By
C. A. de Silva
(*Acting Director*)

Correspondence:—

Correspondence figures for 1955:

	Inward	*Outward*
Head Office { Administrative ...	5,056	4,954
Head Office { Technical ...	442	513
Mycology Department ...	591	411
Botanical Department ...	279	189
Chemical Department ...	538	523
Agronomy Department (up to 31-5-55) ...	357	276
Estate Department ...	956	1,067
Smallholdings Department ...	6,082	10,497
TOTAL ...	14,301	18,430

The demand for the advisory services of the Institute continues to increase. A number of advisory circulars published in 1954 and 1955 has considerably eased the correspondence in the Botanical and Mycological sections.

The advisory correspondence in the Small Holdings Department has increased rapidly with the increased replanting carried out by small holders and "absentee" landlords of limited acreages under the Government Subsidy Scheme. In many instances applications are made in a single letter for information on every aspect of replanting, which requires a brochure of advisory leaflets or a single publication on replanting procedure.

The Estate Superintendent is responsible for the distribution of budwood of new clones to commercial estates. Both the Administrative and Estate Departments have undertaken the supervision of large nurseries opened out under the Government Subsidy Scheme. The accountancy in this connection has inevitably increased the correspondence of these departments.

In general the advisory work of the technical departments constitutes an embarassment to the conduct of research, and there is need for a separate advisory department.

STAFF

Senior Staff:—

The Director, Dr. H. E. Young, was in charge of the work of the Institute until his retirement on 6th October. Mr. C. A. de Silva, Botanist, was appointed Acting Director on Dr. Young's retirement and he was in charge during the rest of the year.

The Botanist, Mr. C. A. de Silva, was on duty throughout the year.

The Chemist, Dr. E. J. Risdon, was on duty throughout the year.

The Agronomist, Mr. D. H. Constable, proceeded on 8 months end-of-contract leave on 1st June.

Mr. C. A. de Silva, Botanist, acted for the Mycologist from June 1954 until the appointment of Mr. O. S. Peries, Technical Assistant to the Director, as Acting Plant Pathologist on 6th October.

The Plant Pathologist, Dr. A. Riggenbach, commenced duties in London on 1st December and took up duties at Dartonfield on 23rd December.

The Smallholdings Propaganda Officer, Mr. W. I. Pieris, was on duty throughout the year.

The Administrative Secretary, Mr. C. D. de Fonseka, was on one month end-of-contract leave from 27th June and was on duty for the remainder of the year.

The Estate Superintendent, Mr. G. W. D. Barnet, resigned on 6th February and Mr. L. Wijeyagunawardene, Plant Breeder, was appointed Acting Estate Superintendent until he was confirmed in the appointment on 17th March. Mr. Wijeyagunawardene was on duty throughout the year.

The Technical Assistant to the Director, Mr. O. S. Peries, was confirmed in his appointment and promoted to the Senior Staff Grade II with effect from 6th October. He was on duty throughout the year.

Intermediate Staff:—

The Assistant Mycologist, Mr. D. M. Fernando, was on end-of-contract leave from 19th April till 27th July and was on sick leave for a period of 3 months until 26th October. He was transferred to the Botany Department as Assistant Plant Breeder with effect from 27th October and was on duty for the remainder of the year.

The Research Assistant Agronomy, Mr. A. J. Jeevaratnam, continued his studies at the Waite Agricultural Research Institute, South Australia, under the Colombo Plan Training Scheme and was granted an extension of the scholarship for a further period of two months to enable him to complete his M.Sc. degree.

The Research Assistant Chemistry, Mr. M. Nadarajah, was on duty throughout the year.

The Research Assistant Botany, Mr. L. B. Chandrasekera, was on duty throughout the year.

The Senior Assistant Propaganda Officer, Mr. N. W. Palihawadana, was on duty throughout the year.

The Assistant Propaganda Officer (South), Mr. K. Wilson de Silva and the Assistant Propaganda Officer (North), Mr. H. H. Peiris, were on duty throughout the year.

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

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

Mr. J. A. Attygalle (Office Assistant)
Mr. S. P. Fernando (Clerk Typist)
Mr. W. D. Jayawansa (Clerk Typist)
Mr. P. Samarasinghe (Clerk Typist)
Mr. M. N. Jamaldeen (Record Clerk)
Mr. U. D. Gunadasa (Junior Clerk)
Mr. U. C. F. Perera (Clerk-Librarian)
Mr. H. Kulasena (Senior Account's Clerk)
Mr. M. T. Nallawangsa (Pay Clerk)
Mr. E. P. D. Roberts (Junior Accts. Clerk)
Mr. T. M. A. Rodrigo (Junior Accts. Clerk)
Mr. D. P. W. Gunasekera (Store Keeper)

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

Senior	*Intermediate*	*Assistant*	*Minor*	*Total*
7	7	89	34	137

General:—

The Director as ex-officio Vice-Chairman served on the Rubber Research Board throughout the year and as a member of the Smallholdings and Experimental Committees. He also served as a member of the Central Board of Agriculture, the Rubber Replanting Advisory Board, and on the Committee of the Kalutara District Planters' Association. He attended meetings of the General and Agency Section Committees of the Planters' Association of Ceylon and Low Country Products Association.

Lectures and talks were given by members of the Staff to districts and central planting bodies.

Planting:—

At the end of the year the cultivated acreage of Dartonfield Group was 946½ acres of which 288¾ acres were in tapping. The crop for the year averaged 630 lbs. dry rubber per acre. The immature acreage was 643¼ acres of which about 85 acres were planted with new planting material in field experiments. The budwood and seedling nurseries were about 20 acres in extent.

Mr. J. D. Farquharson resigned his post as Visiting Agent and was succeeded by Mr. C. A. C. Bowen.

Buildings:—

Two staff bungalows were built one at Dartonfield and the other at Hedigalla, Five incinerators, an extension to the Asst. Staff Chummery, a petrol shed at Dartonfield, six double unit quarters for labourers at Hedigalla, and a motor garage completed the 1955 building programme. Other construction work was undertaken in connection with water and power supply, minor roads and the laying of a main underground cable at Dartonfield.

Rubber Replanting Subsidy Scheme:—

The work of the Staff of the Rubber Research Institute in connection with the above scheme has helped those responsible for the practical side to maintain the rehabilitation of the rubber industry at a high level of achievement.

The staff of the Smallholdings Department has been increased again in 1955 to cope with the ever increasing demands made on this department for practical help and advice.

The Institute continued to supervise the Subsidy Scheme nursery at Egal Oya and the supervising officer seconded for service from the R.R.I.C., was released from his duties in December 1955. The newly appointed supervisor continues to work under the supervision of the Estate Superintendent.

A further 60 acres of nurseries for the Subsidy Scheme are due to be opened out on our Hedigalla Estate at short notice in 1956, to cope with further supplies of planting material required in the future. Provision has been made for the appointment of a separate field staff, which will supervise the opening of these nurseries in virgin jungle. A subsidiary provision has been made for building up nurseries on 30 acres in 1956, for the temporary supplies of planting material in 1957 and 1958, in young rubber clearings of the Institute. The nursery beds will be prepared between planted rows of rubber on the avenue system.

The responsibility for all accountancy in connection with the disbursement of funds and work involved in obtaining supplies of seed and general maintenance of nurseries will devolve on the Institute's staff, especially on the Estate Superintendent.

Provision has been made for extra clerical staff, but with increasing work on accountancy, it will be necessary to further increase the staff in the near future.

The Royal Agricultural and Food Exhibition, 1956:—

A joint rubber stall was provided for the Rubber Research Institute and the Rubber Controller's Department. The work involved in the renovation and preparation of exhibits as well as the erection of the rubber stall was in the hands of the Institute's staff. A heavy claim was made on the working hours as well as on overtime work of our Senior Artisan, who was away in Colombo for nearly one month.

Publications:—

During the year the following publications were issued:—

Report of the Work of the Rubber Research Board for 1954
Combined 3rd and 4th Quarterly Circulars for 1954
First Quarterly Circular for 1955
Second Quarterly Circular for 1955
Bulletin No. 55—Manurial Diagnosis for Hevea Brasiliensis Part I
,, No. 56—Manurial Diagnosis for Hevea Brasiliensis Part II
Advisory Circular No. 42A—New Local Planting Material for Small Scale Trials on Estates
,, ,, No. 52 —A Guide to the Cost of Replanting Rubber
,, ,, No. 53 —Prevention of Coagulation in the Field
,, ,, No. 54 —Bark Rot and Canker of the Rubber Tree
,, ,, No. 56 —Cover Crops
,, ,, No. 57 —Notes on Rubber Seedling Nurseries.

Visitors:—

30 foreign and 51 local visitors including Dr. J. G. J. A. Mass of Rubber Stichting, Delft, Netherlands, visited the Institute by appointment during the year under review.

Many local schools and other educational institutions were granted permission to visit the Institute at short notice.

DEPARTMENTAL NOTES

Botany:—

The Botany Department was again mainly occupied with plant breeding work, and the testing of hand pollinated clonal seedlings and clones established from the major proportion of 4,700 hand pollinated seedlings, which have been established in trials laid out from 1941 to 1947. 1,100 H.P. seedlings and their derived 5 tree clones are test-tapped on 9 commercial estates.

Field experiments under the supervision of the Botanical Department on crown-budding, 'hedge' planting, seed gardens, clone and clonal seedling trials occupy an approximate area of 750 acres out of a total of 947 acres of cultivated rubber of the Institute.

Early selections from many hundreds of 5 or 3 tree clones for further recording of yield data on a per tree basis help the Botanist and his limited staff to keep the field recording on a workable basis.

The following local clones have given outstanding yields:—

(1) Clones Nab. 12 and 20 have given 19 to 20 lbs. dry rubber per tree per year in the 10th year of tapping.

(2) Clones RLD. 9, 13, 22, 24 have given 21 to 23 lbs. dry rubber per tree per year in the 9th year of tapping.

(3) Clones RLD. 28, 29, 31, 33, 37, 40, 41, 42, 45, 46, 47 have given 25 to 37 lbs. dry rubber per tree per year in the 5th tapping year.

(4) Clones RLD. 4, 5, 6 and 7 selected from 120 three tree clones established in 1935 have given very promising yields in the 3rd tapping year in a second trial initiated in 1945.

Advisory Circular No. 42A has been published to enable the rubber growers to make a suitable selection of RLD. clones for small scale trials.

Among the imported clones, RRIM. 501, AVROS. 255 and PR. 107 are high yielding under local conditions of growth. These have been recommended for large scale commercial planting. Clones LCB. 1320, RRIM. 513 and PB. 5/60 have also given promising yields and are recommended for commercial planting on a smaller scale.

Eighty foreign clones from Malaya, Java, Sumatra and Indochina are now successfully established in our nurseries. These can be distributed to commercial estates in 1957. All the outstanding clones recommended for large scale planting in their countries of origin can be found in this collection of foreign clones.

Early test-tapping results in crown-budded experiments show no significant differences in yield of centre-sections budded at 5 feet and 8 feet from ground level with a particular crown. It has been possible to make tentative recommendations for crown-budding with clone LCB. 870 at 6 feet, so that the operation can be carried out from ground level, thus eliminating the use of a stool or ladder.

In the "hedge" planting experiment 6′ × 45′ on Hedigalla estate the growth of the better known clones at 6 years of age have come up to the standards of good growth of the same clones of similar age in the more square planted areas. The 31 clones in this experiment will be tapped in 1956.

Planting 8′ × 30′ is recommended as a popular "avenue" system of planting, which has been adopted on the best known estates in Malaya. Planting 6′ × 45′ hardly comes within the category of the more extreme forms of "hedge" planting adopted in outside countries and should be considered as a more extreme form of "avenue" planting for trial on a small scale.

"Avenue" systems of planting on the contour on the difficult rubber planting terrain of this country will lead to considerable saving in labour costs, with regard to tree to tree attention in weeding, manuring, tapping and attention to bark diseases.

"Avenue" and "Hedge" planting systems are best adapted for selective thinning of high stands of rubber at random over a period of years and for dusting operations.

The yields of the Oidium resistant Clone LCB. 870 is extremely poor both in the wet low country districts and in the dryer areas. Vigorous growing trees are definitely thin barked and the direct planting of this clone is not recommended. The clone is used for crown-budding against Oidium over 800 feet elevation.

A further 8 clones of the FX and F series which have been found to be resistant to Dothidella ulei (South American Leaf Disease) were imported from the R.R.I. Malaya in 1955, bringing the total up to 25 clones of these series. These were imported by Malaya in exchange for valuable rubber planting material.

80 acres were planted on our Hedigalla Estate with RLD. clones and hand pollinated seedlings in 1955.

Chemistry:—

The Chemical Department has continued its investigations on latex. Attempts have been made to explain the cause and significance of errors in dry rubber content estimates with the use of the metrolac. Advice has been given on the selection of anticoagulant solutions for the limitation of precoagulation.

Attention has been given to the modification of the conventional R.R.S. type smoke-house and the production of improved R.S.S. bale coating solution and bale marking inks.

General advisory visits have been made to estates and factories and where necessary, recommendations have been made for the improvement of manufacturing procedure.

The work on crepes using oxalic acid, bleaching agents, fungicides, etc. has led to tentative suggestions on the use of oxalic acid instead of formic or acetic acid in the normal process or without a preliminary fractional coagulation. An appreciable number of estates are now engaged in large scale tests under their own conditions. An information leaflet has been circulated by the Chemist to Agency Houses, and to many crepe manufacturing estates, which gives the necessary information for preliminary trials.

The Chemist's report also deals with compounded rubber and includes a short account on investigations carried out for ascertaining any possible copper contamination of latex following dusting with copper fungicides. The preliminary indications are that a high degree of contamination of latex rubber

is not at present expected under the conditions of dusting during intermittent or periodic showers of rain during the dusting season.

Mycology:—

The Mycological Department had no permanent Plant Pathologist throughout the year 1955, although the department was kept very busy with dusting experiments in connection with Oidium heveae and leaf and pod disease due to Phytophthora palmivora, the latter appeared quite early in 1955, on rubber successfully sulphur dusted against Oidium, due to sustained periods of wet weather from May onwards throughout the South-West monsoon period.

With successful dusting against Oidium heveae in recent years, the foliage on most estates was very encouraging. A few areas incorrectly dusted and rubber over 1,000 feet came on for somewhat severe attacks of the leaf disease.

Unfortunately the successful control of Oidium heveae with the preservation of flowers led to a prolific pod-set in certain clones. The preliminary attacks of Phytophthora palmivora on pods finally resulted in a spread to leaves and stems. A number of estates in the wet low country districts recorded very severe defoliation due to Phytophthora, especially on clone PB. 86 which is a prolific seed bearer.

Defoliation due to Gleosporium alborubrum and pysiological inactivity of lower foliage without sunlight was reported from a number of estates. The Mycological Department was called upon to suggest ways and means of controlling such defoliation at short notice and it was necessary to issue tentative recommendations on dusting against Gleosporium with fungicides which were not tried out in previous years.

The dusting trials initiated in 1955 included Karathane or Mildex (Dinitrio-capryl-phenyl-crotonate) against Oidium. Copper fungicides, Cuprosana 6 per cent., and organic fungicides of the carbamate series such as Fermspray, Dithane Manzate, and Zerlate were tried out in small scale dusting trials against Phytophthora. All these fungicides gave some indications of successful control. It is known that very minute quantities of copper and carbamates in latex can adversely affect the properties of manufactured rubber, and it was necessary to investigate any possible latex contamination from dusting during the rainy period, when the leaf diseases are prevalent. The Chemical Department undertook to investigate these problems and the preliminary indications are that with the adoption of certain precautions in tapping during the dusting period the danger of such contamination may not be serious. It is hoped that more definite recommendations on dusting will be possible in 1956, if weather conditions prove favourable for Phytophthora diseases.

Bark diseases were prevalent as a result of the presence of Phytophthora diseases on pods and leaves. In certain instances clones susceptible to bark diseases were badly affected with Bark Rot and Canker resulting in considerable damage to tapping panels. In many cases bark diseases got out of hand due to the incorrect use of fungicidal applications on bark exposed to infection.

Root disease in replanted areas has again come to the forefront with the initiation of the government sponsored Rubber Rehabilitation Scheme. Leptoporus (Fomes) lignosus is the most common and calls for careful attention during the time of uprooting the old stand of rubber. The possible presence of "Fomes" on the roots of old rubber with no above ground symptoms has been stressed again. Failure to eradicate such foci of infection can result in many deaths of young budded and seedling plants in replanted areas. This has been amply confirmed in many small holdings.

In areas known to have several foci of 'Fomes' infection prior to replanting it is best to carefully clean up such points at the time of uprooting and carry out a clean burn of all timber on the land.

Other diseases of little economic importance were caused by Fomes lamaoensis, Ustulina deusta, Helminthosporium heveae, and Botryodiplodia theobromae.

Entomological pests included scale insects and mites, cockchafer grubs, cutworms, termites, and caterpillars. Only minor damage was caused by these pests.

Breeding work with the Oidium resistant clone LCB. 870 was continued, and more useful hand pollinated crosses were added to our collections for future observations.

Preliminary trials in the field were carried out during the Oidium season with the "Hirst Spore Trap" worked by a 4 stroke-engine and a clockwork mechanism, which entraps spores on a grease-smeared miscroscope slide by suction. Some interesting information has been obtained on the diurnal rhythm which governs the release of spores of Oidium heveae.

Agronomy:—

The Agronomist was away on overseas vacation leave for 8 months and routine attention was given to field experiments with N.P.K. manuring by the field staff.

These experiments are located on 5 estates which represent a wide range of rubber planting land in Ceylon. More recent experiments were initiated on 5 other estates.

In general the experiments which have been established for a sufficient length of time show a clear nitrogen effect. A smaller but definite potash effect occurs on a minority. Phosphate effects are less, presumably due to the heavy dose of saphos in the planting hole, which with maximum utilisation would support 3 years growth.

In the laboratory, plant analyses have been carried out on samples taken from NPK experiments on Padukka and Nakiadeniya. A number of soil samples have been examined for nitrogen, phosphate and potash. Increasing nitrogen has a slight effect on both leaf and stalk nitrogen. The effects of phosphorus under the same conditions do not appear to be significant. Greater concentration effects are detected in the leaf stalk than in the leaf by potassium.

The effect of dolomite manuring shows that there is a general deficiency of soil magnesium and correction for soil magnesium may be necessary independent of other manuring.

A rapid increase of both manganese and boron has been found on both estates with rising nitrogen. A severe decline in Molybdenum was found on Padukka Estate with increasing nitrogen.

The whole question of "potash yellowing" may have to be reviewed again in the light of the above findings associated with excessive nitrogen manuring.

The total nitrogen, phosphorus and potash determinations as well as those for citric acid extracts for phosphorus and potash have been studied in relation

to fertility trends. Useful information has been obtained of the efficiency of the methods used for particular requirements.

Little work was done on deficiency symptoms in the absence of the Agronomist as the symptoms do not appear until midyear.

Studies have also been made on the mechanical analysis of soil with and without a hydrochloric acid pretreatment. Observations are made on the increase of the clay content on acid treatment, which may be misleading. A high percentage of sand in all samples analysed indicates a high degree of leaching.

By means of an estate questionnaire a part of the course of the main quartz area was plotted, and specific recommendations were made for the manuring of these quatzitic areas.

Preliminary experiments were carried out on weed killing using Amizole, RD. 4196, and 3 proprietory brands of Pentachlorophenol. The results obtained indicate that grass eradication before replanting is definitely possible at an economic price by chemical methods.

Small Holdings Propaganda Department:—

Five extra temporary Rubber Instructors and 2 temporary Replanting Assistants were appointed on August 1955. The Small Holdings Propaganda Officer and his staff of over 50 members in the office and in the field have been heavily engaged in the field and advisory work in connection with the Govt. Replanting Subsidy Scheme. The volume of correspondence testifies to this work; 6082 inward and 10497 communications outward for the year 1955.

The success of the practical side of the subsidy scheme in the case of smallholdings is in a great measure due to the Small Holdings Dept. supervised by our most experienced officer Mr. W. I. Pieris B.A. (Cantab.), who completes 26 years of indefatigable service in the R.R.I.C. in September 1956, when he retires from service.

A trial scheme for sulphur dusting was carried out in the Kegalle district in 1955. 78 holdings comprising 178 were dusted with marked beneficial results. The owners of the holdings contributed Rs. 20/- to Rs. 30/- per acre. The overall cost come to about Rs. 49/- per acre. An enlarged Scheme with 16 dusting machines on a co-operative basis was organised for 1956. The owners will carry out the dusting themselves with supervision by the S.H.P.O.'s Department. A deposit of Rs. 15/- will be collected from each owner.

The quality of sheet rubber was improved by sheet making demonstrations and constructing smoke-houses. 434 demonstrations were given and 34 private smoke-houses were constructed. 500 square feet of mesh and 116 aluminium pans were sold at concession rates. 254 acid samples were tested. The R.I.'s paid 164 visits to latex centres. 182 tapping, 119 disease control, and 375 miscellaneous demonstrations were given by Instructors.

It will be appreciated that a substantial contribution has been made by the Rubber Research Institute towards the rehabilitation of small and middle class rubber plantations in this country.

Detailed Departmental Reports:—

The summaries and detailed reports of each department follow under the respective departmental headings.

REPORT OF THE CHEMICAL DEPARTMENT FOR THE YEAR 1955

By

E. J. Risdon

SUMMARY

The first paragraph of the summary of the Annual Report of the Chemical Department for 1954 (p. 12) explains in detail the basic objectives and type of work carried out by the Department, and the summarising Report for 1955, attached herewith, is subdivided in the usual manner into a total of five Sections and twenty seven Subsections each dealing with essentially different subjects. Section No. 1 deals primarily with matters of internal administration and of a non-experimental nature and includes (Subsection 1.2) the statistics of the more routine type advisory work of the Department. While this routine advisory work takes a very appreciable portion of the time of essentially experimental officers, it is very questionable whether much of this work could be usefully or easily carried out by officers with inadequate knowledge of Estate etc. practice.

The work on latex (determination of d.r.c., precoagulation etc.) is summarised in Section No. 2, where particular attention is drawn to the recent publication in a Quarterly Circular of an article which attempts to explain the cause and significance (under certain conditions) of errors in d.r.c. estimates arising from the use of the metrolac. The work on the use of the per cent. total solids estimation to calculate the per cent. d.r.c. of ammoniated latex has also been written up in the Quarterly Circulars. Additional attention has been given on an experimental and advisory basis to the procedures to be employed for the limitation of precoagulation in latex and in this connection Advisory Circular No. 53, which stresses the practical aspects of the subject, has been distributed during the period under review. This Report also emphasised the fact that a measure of discrimination, and hence a reasonable comprehension of the background of the subject, is often necessary in the selection of the anti-coagulant solution.

Section No. 3 of the Report deals with the production of R.S.S. and A.D.S. and further attention has been given to (*a*) the modification of conventional R.R.S. type smoke-houses to increase their theoretical capacity and to (*b*) the design and performance of temporary type smoke-houses. Information obtained in the latter connection strongly suggests, that for large and medium size temporary type smoke-houses, built without appreciable bulking space, a 'multi-flue smoke inlet system' is to be preferred on theoretical and practical grounds. Further attention has been given to the production of improved R.S.S. bale coating solutions and bale marking inks. Buyers' reports have not yet been received on all the experimental bales despatched overseas, but, in general, comments have been favourable except in the respect of 'excess penetration' of the improved marking ink.

The work on crepes (use of oxalic acid, bleaching agents, fungicides etc.) is summarised in Section No. 4. The possibilities of oxalic acid as a crepe coagulant have been described in an information leaflet circulated to Agency

Houses and to many crepe Estates in the second half of 1955, and an appreciable number of Estates are now engaged in larger scale tests under their own conditions, generally by a direct replacement of formic or acetic acids by oxalic acid either in the normal process or without a preliminary fractional coagulation. It should be appreciated that the possibilities of oxalic acid must be expected to depend upon the latex involved and upon the differential between the various grades. Work on RPA.3 Concentrate gives, as might be anticipated, no reason to suppose that this material could not be used provided the proper precautions (Subsection No. 4.5) are observed, but, in view of the difficulties which might occur if RPA.3 standard and RPA.3 concentrate were muddled on the Estate, there seems to be little need to accelerate the replacement of RPA.3 standard by the Concentrate. Some attention has also been given (Subsection No. 4.3) to the possibility of accelerating the fractional coagulation process, but this work is not completed. Work on the hardness (M50) of sole crepe has continued and samples have been despatched to Europe for trials.

The final Section of the Report deals primarily with compounded rubber and includes a shortened account (Subsection No. 5.3) of the work designed to ascertain the degree of contamination likely to be found when copper containing dusts are used as fungicides against phytophthora leaf disease. Subject to amendment in the light of further data, the analytical figures at present available for latex total solids films and for processed latex crepes do not suggest that a high degree of contamination, as judged by the total copper content of the subsamples, need be obtained.

DETAILED REPORT

Section I.—General:

1.1 Staff.—The Department consists of the Chemist, the Research Assistant, Mr. M. Nadarajah, B.SC. (Ceylon), three Technical Assistants, Messrs. D. S. Muthukuda, M. T. Veerabangsa and G. G. Gnanasegaram, one Attendant and one Peon. Three to nine labourers are made available by Estate Department as and when required. On the basis of suggestions offered within the Department and by overseas associated Research Institutions, the Administration is negotiating with the Colombo Plan Technical Aid authorities for Mr. Nadarajah to undergo a course of research training overseas, probably in the United Kingdom. It is at present expected that the Research Assistant might leave Ceylon towards the end of the first half of 1956 and the Colombo Plan Authorities have been requested to give at least one months notice of the provision of the facilities to be offered. The possibility that an additional appointment might be desirable during Mr. Nadarajah's absence for probably at least 2 years was brought to the attention of the Administrative Committee of the Board and it was pointed out that the necessity for an additional appointment was largely conditioned by the Board's attitude to development type work and by the volume and nature of the advisory work which would be encountered during this officer's absence.

The table below shows the working days of absence by the various members of the Department. All members were on duty throughout the whole period.

By		*Casual*	*Vacation*	*Illness*	*Comp.*	*No. pay*	*Total*
Chemist		8	11	—	2	—	21
Research Assistant	...	16	24	15	—	—	55
Technical Assistants	(D.S.M.)	14	12	3	3	—	32
	(M.T.V.)	9	12	3	4	—	28
	(G.G.G.)	15	13	18	14	8	68
Attendant	(P.K.W.)	12	12	5	4½	—	33½
Peon	(W.D.D.)	15½	11	5	11½	—	43

Mr. Gnanasegaram, Technical Assistant, paid a private visit to Malaya, and was permitted by the Director R.R.I.M. to visit the Chemical Division R.R.I.M.

1.2 Advisory Services, Correspondences, etc.—Immediately subsequent to the return of the Chemist from overseas leave at the beginning of December 1954 the volume of advisory work was slightly smaller than usual, but since that time, particularly in the second half of 1955, there has been a very marked increase in requests for services falling under this heading. Advisory work, which is a major activity of all the technical Departments of the R.R.I.C., still requires many of the officers of the Department to devote a very large part of their time to visits, correspondence, preparation of reports and to examination of the technical literature relevant to the advisory and other services provided by the Department for the industry in Ceylon. The table below gives a summary of much of the data relevant to this Subsection:

(*a*)	Unsolicited samples etc. submitted for test or report ...	46
(*b*)	Solicited samples (excluding technical classification samples)	40
(*c*)	Technical Classification samples	250
(*d*)	Groups of visitors to the Department	70
(*e*)	Correspondence incoming	538
(*f*)	Correspondence outgoing, excluding items under (*g*) ...	515
(*g*)	Roneoed letters, Pamphlets and leaflets outgoing ...	8
(*h*)	Visits by the Staff of the Department (Details below) ...	98

By	*R.R.I.C. Estates*	*Other Estates*	*Other Visits*	*Total*
Chemist ...	4	9	20	33
Research Assistant ...	3	5	—	8
Technical Assistants ...	33	14	10	57

The figures in column No. 2 of (*h*) above refer only to visits outside Dartonfield or to visits to the field for experimental purposes, and in all the figures a visit to more than one Estate etc. per day is classed as only one visit. Advisory visits to outside Estates require the preparation of a detailed report collating data obtained at, or commenting upon many aspects of the process followed at the Estate involved, and, in a number of instances, the preparation and checking of these confirmatory reports is two to four times as lengthy as the visits themselves. In this connection it is again emphasised that the uncertainty concerning the nature and volume of this advisory work makes the preparation of programmes and estimates for the Department somewhat difficult. Acknowledgement is made to Estate Department for the temporary services of the Rubber Maker on a number of these advisory visits.

1.3. Publications, etc.—The publications of the Institute, issued during the period under review, to which members of the Department have contributed partially or in toto include:

(*a*) The Annual Report of the R.R.B. for 1954
(*b*) Advisory Circular No. 53
(*c*) R.R.I.C. Quarterly Circulars 1954 **30-2** p. 35-43
(*d*) R.R.I.C. Quarterly Circulars 1955 **31-1** p. 8-12
(*e*) R.R.I.C. Quarterly Circulars 1955 **31-2** p. 34-49, p. 50-55.

An additional three articles for the Quarterly Circulars are in various stages of preparation for completion in 1956. Proof reading of the publications of the Department is carried out mainly in the Department and regret is expressed over the quality of the proof reading, in the absence of the principal author, of two articles submitted in 1954. The circulation of the above and of other summarising publications and leaflets on various aspects of the work of the Department in the last few years will, it is hoped, permit a reduction in the size of the annual and half yearly reports to more readable limits without loss in continuity and should allow the Department to concentrate its limited development type facilities on a smaller range of subjects.

1.4. Miscellaneous.—Various samples for the Rubber Control Dept.—R.R.I.C. stall at the 1956 Royal Agricultural and Food Exhibition in Colombo are in the process of preparation, and arrangements have been made with various Colombo Engineering Companies for the supply of models or photographs of rubber production machinery made in Ceylon to be displayed. A large Crepe Estate in the Galle District and the principal manufacturer of centrifuged latex in Ceylon have also agreed to assist in the matter of photographs. The Chemist attended a number of meetings of the Kalutara District P.A. answering questions as appropriate. Acknowledgement is made to the technical officers of (*a*) the British Rubber Producers Research Association of Welwyn Garden City and of (*b*) the London Advisory Committee for Rubber Research(Ceylon and Malaya) for advice, comments and suggestions on certain technical matters.

Section II.—Latex:

2.1. Equipment.—No new equipment has been received for use under this Section during the period under review. Both the Doran pH meter and the Eel flame photometer have had to undergo repairs, but a portable Beckman pH meter has been available as a replacement for the Doran.

2.2. Approximate determination of the d.r.c. of Fresh Latex.—Approximate determinations of the d.r.c. are required for various factory and record purposes and, as mentioned previously (Ann. Rept. 1952-1954), information on the reliability of the standard glass (O'Brien scale) metrolac for budded rubber latex has been sought by measuring the d.r.c. obtained by trial coagulation and the value obtained with the metrolac on the same latex suitably diluted. The data summarised in the 1952-1953 reports did not, in general, indicate whether the metrolac could be employed with reasonable accuracy in large monoclonal blocks where the trees are all of approximately the same age. Large blocks of this nature are found on commercial Estates but are not available on R.R.I.C. Estates. However, it was thought that information of at least limited value in this connection could perhaps be obtained by splitting a number of monoclonal (tappers') tasks or part tasks into subtasks and an experiment of this type was organised at Nivitigalakele and has been carried out by Estate Dept. Subtasks of 3 clones in the Nivitigalakele 1946 clearing were tested over 27 days in 1954 and the data statistically examined in 1955. The analysis suggests that the differences between the numerical value of the error of the metrolac between clones and between subtasks of the same clone are not significant in comparison with their interaction but are significant in comparison with the clones x days interaction, which is the usual error. As the experiment was not conducted over a period of continuous tapping and as the personnel were not previously familiar with the work, the experiment was repeated at Dartonfield over a longer period of continuous tapping. In this case the clones selected show a larger range of mean metrolac error values and the differences between clones and between subtasks of the same clones are clearly significant in comparison with their interaction. On the basis of this

data it has been tentatively concluded that any suggestion that the differences in metrolac errors between tasks of one clone are negligible may have to be accepted with caution. In this connection it should be noted that, until the cause of the variations in the metrolac error is clear, any suggestion that with larger tasks the differences between metrolac errors of tasks of a single clone will be quite small need not necessarily be correct.

In order to simulate commercial conditions no corrections have been applied in any of these tests for temperature differences between latex samples at weighing up and at subsampling, and, although the standing time of the latex in the covered-in weighing up shed before the start of weighing up is generally not negligible, it could be suggested that the differences in mean metrolac errors between clones or tasks might be due to systematic temperature differences. This view is not entirely supported by the data of the experiments described in the previous paragraph, where the differences in mean metrolac errors between clones appear to be significant in comparison with the clones x days interaction and where this interaction (clone x days) also appears to be significant, implying that the differences in metrolac errors found between clonal tasks may not necessarily be constant from day to day. Measurements of the temperatures of latex at weighing up and comparisons of the variations observed with the published data for the change of density of latex with temperature does not suggest that systematic temperature differences will account for a very large part of the metrolac errors found between clones.

A descriptive article on the use of the metrolac incorporating much of the earlier work on this subject has been completed in the period under review and appears as R.R.I.C. Quarterly Circulars 1955 **31-2** p. 34-49. The principal object of this article is to remind users of the metrolac in Ceylon that this instrument should not be regarded as highly accurate under all normal conditions and was never intended to be. The theoretical principles underlying the use of this special type of hydrometer are explained in a manner, which, it is hoped, will make these points clear to Planters in Ceylon. The experimental data collected at Dartonfield are employed to predict the order of error which might be found in uses to which the instrument is frequently put in Ceylon. Particular emphasis is placed upon the need to consider whether the instrument is necessarily suitable for a comparison of the commercial yields of areas of new clones or of other experimental type areas. Reference is also made to the methods by which metrolacs may be checked and to the possible influence of certain types of adulteration. In connection with the latter point various inquiries have been received concerning the influence of solutions of the conventional anticoagulant powders on the metrolac reading and it may be appropriate to mention that, in the absence of chemical interaction, the influence of such solutions upon the tappers' total input of dry rubber depends upon the density and volume of the anticoagulant used and that over quite wide ranges of concentration the use of excess washing soda, which can often be detected with pH indicator papers, does not favour the tappers. Inquiries for supplies of new glass (O'Brien scale) metrolacs have been directed to the manufacturers, Messrs. Dring and Fage of 150-152 Tooley Street, London S.E.1, and to Messrs Hunter & Co. Ltd. P.O. Box 214, Colombo.

2.3. Determinations of the D.R.C. of Ammoniated Latex.—This subject, which is of considerable importance to Estates engaged in or contemplating sales of ammoniated latex for concentration purposes, has been referred to in some detail in earlier reports and in the Quarterly Circulars, and only certain aspects of the subject have been considered in the period under review. In the Report for 1952 (p. 14) it was suggested that the d.r.c. of bulks of latex might, perhaps, be estimated by a trial coagulation type procedure using large

subsamples, *i.e.* of one gallon or upwards, to compensate for the lack of the accurate balances required for the methods suggested in B.S. 1672: Part I: 1950. In the report for 1954 p. 15-16 (Subsection 2.3) the experience of one Estate in this connection are described together with a comment to the effect that the Department proposed to investigate certain aspects of this method in greater detail.

Tests carried out in the period under review with a number of very lightly ammoniated latex samples suggest that the mean difference between the d.r.c. (calculated in lbs/gall. using, where appropriate, a fixed density factor of .980 gm/ml.) obtained by the modified trial coagulation method (with 1 gallon subsamples) and the value obtained by the methods of B.S. 1672 need not exceed a figure equivalent to about 1.5 to 2 lbs. of rubber per 100 lbs. involved, provided reasonable care is taken with the weighing. With less accurate scales the difference, in the same terminology, was about 2 lbs. to 2.5 lbs. per 100 lbs. of rubber involved. The actual difference, in the terminology used, will of course depend upon the average d.r.c. of the latex and the figures quoted refer to a latex of about 30 per cent d.r.c. The corresponding standard deviation of a single difference would be equivalent to about 3 to 3.5 lbs. of rubber per 100 lbs. of rubber involved. In commercial practice, the actual average error (in the above terminology) to be expected over a long period of time will depend upon the accuracy of the measurement of the weights or volumes of latex, the d.r.c. of the individual lots of latex and upon the volumes or weights of latex involved as well as upon the error of the d.r.c. estimation. In this connection it should also be noted that, in the absence of a really reliable method of estimating the d.r.c. of the subsamples, too much importance should not necessarily be placed upon relatively small differences between buyers' and sellers' estimates of the total rubber in individual deliveries considered alone. Nevertheless, it has been our view that this modified trial coagulation method should be able to serve as, at least, a rough and relatively simple check of buyers' estimates of % d.r.c. in latex and this view has been confirmed by the Estate data summarised in a previous report as mentioned above. The method cannot, of course, be expected to be as precise as the methods of B.S. 1672 where the standard deviation of individual estimates of the % d.r.c. can be equivalent to a figure of about .12 lbs. per 100 lbs. of rubber involved, although with less accurate operators a figure equivalent to about .45 lbs. per 100 lbs. of rubber involved has been recorded.

When the metrolac weighing up figure is used to assess the dry rubber in deliveries of latex, the error is the relevant portion of the total factory excess and in commercial practice this procedure usually involves the assumption that the relevant portion of the factory excess remains constant over long periods of time. While this subject is considered in greater detail in an article for the Quarterly Circulars, a little thought will show that the factory excess is usually only a measure of the weighted metrolac error and figures recently obtained suggest that, under particularly unfavourable circumstances, a change in, for example, the clonal tasks involved could give errors for the rubber in latex deliveries higher than 5 lbs. per 100 lbs. involved.

2.4. Calculation of % d.r.c. from the % Total Solids (% t.s.).— While the methods of B.S. 1672 for the determination of % d.r.c. of ammoniated latex and the modifications employed for fresh latex are rather tedious, the method of B.S. 1672 suggested for the determination of the % t.s. is far less time consuming and, as noted in the Report for 1952 (p. 11), the suggestion has been made in the literature that the % d.r.c. might be calculated from % t.s. Following the advice that certain buyers of latex in Ceylon contemplated the use of the % t.s. to calculate the % d.r.c. of samples of ammoniated latex,

limited work on the relationship between the % t.s. and % d.r.c. was carried out in 1952. This work has been extended during the period under review and the data published in an article in the Quarterly Circulars (1955 **31-2** p. 50-55).

Several relationships between % t.s. and % d.r.c. may be deduced depending upon the assumptions made but it seems likely that the simple relationship % d.r.c. = K x % t.s. is amongst the most useful, and various additional tests have been carried out to ascertain some information on the variation of K for different tasks, days, ammonia content and for different intervals between ammoniation and testing. The data available suggest that K is not necessarily independent of the interval between ammoniation and testing, and the simplification that for all fresh latex samples K is independent of the clonal latex samples or of the day of sampling cannot necessarily be expected to hold. The tentative conclusion drawn from the limited tests carried out is that calculation of the % d.r.c. of samples of latex from the observed % t.s. by means of a correction factor of the type mentioned will not necessarily give an accurate estimate of the daily % d.r.c., primarily because the factor can vary between latex samples (1st series of tests) and between days (2nd series of tests). The standard deviation of average K values found between days was .0145. This could correspond to about 1.65 lbs. of rubber per 100 lbs. involved and is considered rather high for accurate work. This method of arriving at % d.r.c. values might, of course, be applicable to latex from certain specified and constant areas once the necessary basic information on the average K value and on the daily and seasonal drifts of K values are known for the area concerned; but, lacking such information, the use of the procedure seems hardly justified for the highest accuracy. Thus, if an Estate sells latex from certain fixed tasks only, small daily variations in K need not necessarily be of great consequence provided these errors balance out in the sense that the total rubber delivered is not inaccurately estimated. However, an error of —. 3% in the % d.r.c., in one week is not necessarily balanced by an error of + .3 per cent. in the following week, unless, for example, the actual total dry rubber involved is equal in both cases; and, in a similar manner, it might be difficult to balance out errors due to seasonal drifts in K values or to changes in the tasks involved in the latex deliveries.

2.5. Precoagulation.—This subject has been mentioned in some detail in previous Reports and a large part of the literature and experimental work has been summarised with special reference to crepe manufacture in an article in the Quarterly Circulars (1954 **30-2** p. 35-43). It is regretted that, in the absence of the principal author, the quality of the proof correction of this article was not very high. As no adverse comments on the suggestions in this article were received from Planters in Ceylon, some of the information summarised therein, together with fuller process details etc., has been incorporated in an article in the Quarterly Circulars (1955 **31-1** p. 8-12), which has also been issued as Advisory Circular No. 53. The expectation, that the publication of these articles would serve to limit correspondence and advisory work on this subject, has not been entirely fulfilled and the Department has on a number of occasions detached an Assistant Staff Officer for advisory and experimental duty in connection with this subject at outside Estates. Upto the present no cases have been encountered where the basic principles given in the articles would appear to be inappropriate. In this connection, it would be appropriate to emphasise here that the typical stocks solutions given in the Institute's publication are not and were never implied to be inflexible, and that in particularly adverse conditions, such as with young rubber or where ungroomed trees and long grass prevails with only one cup per tree, the quantities of anticoagulant in the typical stock solutions have been inadequate. In general, however, the difficulties at most Estates contacted in this connection could be substantially diminished by the use of the anticoagulant in the shells, *i.e.* before collection.

The publications mentioned above suggested that washing soda has been used quite successfully by the Department's staff on a number of outside crepe Estates and during the period under review various experiments have also been carried out to ascertain the amounts of washing soda required to transport Nivitigalakele latex to Dartonfield. In general about .07 per cent. washing soda on the latex depending upon the clone etc. has been employed with at least .04 per cent. of this being used in the field rather than in the collection tank. The Report for 1954 mentioned that the possibilities of the use of washing soda —one of the cheaper latex anticoagulants—for R.S.S. Estates would be re-examined to ascertain whether a definite critical limit existed for the concentration of washing soda below which bubbles in the finished R.S.S. would not normally be obtained. Small scale trials on an outside Estate suggested that, at a concentration of .2 per cent. on the latex, bubbles were usually found, although at .1 per cent. the R.S.S. was free from these bubbles. Larger scale tests whereby Nivitigalakele latex containing approximately .07 per cent. washing soda was transported to Dartonfield for manufacture showed a small number of bubbles in about 5 to 7 per cent. of the finished sheets. Tentatively it has been concluded that at concentrations of washing soda much above .1 per cent. the latex may not be suitable for R.S.S. manufacture and that at concentrations appreciably below this figure the danger of bubbles is likely to be considerably less, although it should be understood that the validity of these conclusions may depend upon the individual conditions and upon the views of the relevant Packer on the appearance of limited numbers of bubbles. In connection with the use of washing soda it should be mentioned that the powder form, which contains the lower amount of water of crystallisation, should be employed in preference to the crystal form, and that where only the latter is available the larger lumps should be broken up and the whole left exposed to the air in the factory until it turns to the powder form. Certain Estates have suggested that washing soda should be used in the solid form *i.e.* a 'pinch' in the cups; however, this procedure is not generally recommended by the Department due to the lack of control in the method and to this risk of difficulties such as the use of excessive proportions of acid in the factory.

2.6. The Inorganic Constituents of Ceylon Latex.—This subject has been included in the programme of the Department for a number of years, but, due to the pressure of other work comparatively little progress has been made. The Annual Report for 1954 (Subsection 2.7 p. 18-19) refers to certain aspects of this subject under a slightly different title and the relevant Subsection of the half yearly report for 1955 (C.P. No. 1907 p. 7-9) includes a summary of much, but not all, of the technical and semi-technical literature on certain aspects of this subject. This examination of the literature has continued as circumstances permitted during the whole of the period under review, but the volume of analytical work has been necessarily curtailed, particularly in the second half of the year, due to requirements in connection with the use of copper based fungicides in the field. The inorganic ions, which may be present in latex or may be added accidently or deliberately during the course of manufacture and which can influence the properties of field latex or of the concentrate or dry rubber made from the latex, include iron, copper, manganese, calcium, magnesium and phosphate. The influence of iron on the colour of crepes has been mentioned previously (Ann. Report 1953 p. 19-21) and copper will be discussed later in this report.

The early R.R.I.C. literature of O'Brien and Philpott emphasises the difficulties likely to be encountered in the factory, *e.g.* precoagulation, when water containing appreciable amounts of calcium is used and later work has been shown that calcareous waters can influence the lamination of sole crepe. Comparatively recently, publications from Indonesia have suggested that

the controlled addition of soluble calcium salts to standardised latex can be employed commercially to accelerate the rate of formation of the first fraction taken in the manufacture of the highest grades of crepes. Although it is probable that this procedure is not at present widely employed in Indonesia, this subject has been investigated extensively (Subsection 4.3) at the request of a number of Agency Houses. The implication that the tendency to precoagulation of newly developed clones could be estimated from the calcium content of the latex is still under examination, but, at present it seems doubtful whether the calcium content of field latex is necessarily an adequate guide to the tendency to precoagulation on a large scale. In this connection it might be noted that, while current theories of precoagulation postulate an important role for calcium and magnesium, the use of anticoagulants containing, in effect, a soluble sequestering agent, such as phosphate, has not yet been shown to be essential under Ceylon conditions, although it is believed that certain Estates have considered the use of soluble phosphate in conjunction with a bactericide or other chemicals.

The possible influence of magnesium and phosphate on the tendency to precoagulation has been implied above and the extensive literature on the phosphate or phosphorus to magnesium ratios of ammoniated field latex and of concentrate clearly implies that the presence of excess magnesium in concentrated latex, that is magnesium in excess of the available phosphate, can be one cause of instability in the concentrate. While the historical background of this subject will, it is hoped, be more adequately treated in due course in a suitable review article in the Quarterly Circulars, it may be noted that, while all samples of concentrated latex must have the inherent stability necessary to withstand mechanical shock during transport, concentration and pumping etc., a closer degree of stability control is generally considered necessary in a concentrate intended for certain uses. The background picture of this aspect of the subject is complicated by the presence in the literature of several clear implications that the P/Mg ratio of ammoniated field latex and hence, under certain conditions, the stability of the resulting concentrate is not entirely independent of soil status. The implication of this suggestion is that deductions made from information obtained outside Ceylon should not necessarily be expected to apply in Ceylon. In particular, clones considered to give 'stable' or 'unstable' concentrate, in this context, outside Ceylon should not necessarily be regarded as 'stable' or 'unstable' under all local conditions. A further implication is, of course, that any programme of useful work on this subject must necessarily be extensive and in effect of long rather than of short term.

The Department has in hand two manurial trials on mature rubber in the 7½ and 9 acres blocks at Dartonfield which, it is hoped, may give some indication of how far manurial treatments can influence the inorganic constituents of latex and the stability of concentrate prepared from the latex. An area of GL.1 is included in this trial, but up to the present no useful information is available. At the same time the latex from certain clones on Dartonfield Group is being collected at regular intervals, analysed for calcium, magnesium and phosphate and the mechanical stability determined on the centrifuge concentrate after varying periods of storage. For this purpose a small scale de Laval Centrifuge is available, and, in general, the analytical procedure used by the Dunlop Rubber Co. or by J.P. and P.K. (R.R.I. of Indonesia) are being followed with only minor amendments. In a number of cases it is hoped that 'total solids' films from the concentrate can also be examined but, as implied earlier, the analytical side of this work has lagged behind the collection of the relevant samples.

2.7. Latex Coagulants.—At the request of the Rubber Commissioner various samples of D.C.I. acetic acid have been examined for use as latex

coagulants. A number of the samples were markedly discoloured, presumably due in part at least to a high proportion of oxidisable material (permanganate decolouration test) usually classified as tarry substances. Tests with these acids in best quality crepe manufacture suggest that much of the coloured matter probably passes out with the serum, but, nevertheless, the small differences seen in the finished crepes made with the more highly coloured samples implies that a considerable measure of discrimination would be necessary in selecting stocks suitable for crepe manufacture. The samples of acid supplied were considerably weaker—70-75 per cent. as acetic acid by titration—than imported commercial acetic acid; but, provided allowance is made for the dilution and the samples supplied were adequately representative, the acids would appear to be quite suitable for R.S.S. manufacture. The copper content of the samples was appreciably higher than that of imported acid but limited technological tests on dry rubber made with the D.C.I. acid samples failed to show any abnormal properties in unfilled mixes.

In response to an inquiry from the Department of Health in connection with possible amendments to the Poisons, Opium and Dangerous Drugs Ordinance (Chap. 172) involving the supply of acetic and formic acids in a substantially diluted form, the R.R.I.C. has suggested that there would appear to be no valid theoretical objection to the issue of diluted acids (10 per cent. acetic acid and 5 per cent. formic acid were suggested by the Department of Health), provided due note is taken of any increase in packaging and freight etc. charges and provided that adequate facilities are available to check the extent and quality of the dilution. Attention was also drawn to the fact that it is difficult to see how misuse of oxalic acid could be prevented in an analogous manner.

Section III.—Smoked and Air Dried Sheet:

3.1. Coagulation.—A limited number of trials have been carried out in a small scale comparison of acetic and oxalic acids in combination with sodium benzoate, with and without sodium bisulphite, for the production of air dried sheet. It would appear that oxalic acid, in combination with a suitable fungicide, where necessary, is likely to give a product of better visual appearance than acetic acid with sodium bisulphite, although it is not certain whether the extra cost will be amply covered. Certain inquiries regarding the possibility of cheapening aluminium coagulating equipment either by the use of alloys or by the fabrication of a larger range of products in Ceylon have been referred to Colombo Engineering Companies. Various inquiries have also been received regarding the increase in acid consumption which may be found with the initial successful use of latex anticoagulants and it is the Institute's experience that on a small scale formic acid consumption may well rise above the figure of 1 fl. oz. per 18 to 22 lbs. d.r.c.

3.2. Milling.—Data on the performance of the Brown's Guthrie Cadet milling battery erected at Dartonfield have been given in the Report for 1954, where it was suggested that the production figures quoted by Wilkin in a recent Quarterly Circular could not be readily exceeded under our conditions. At the same time the possibility of reducing the expenditure on tank coagulation equipment by increasing the d.r.c. at a standardisation was considered, and it was concluded that any appreciable increase in d.r.c. at standardisation tended to increase the thickness of the sheets, or to lead to significant tearing during milling. In the period under review this subject has also been examined from the viewpoint of the width of wet sheets obtained from the Guthrie. The width of wet sheet produced is of major importance in relation to the size of racks and to the direction of the reapears involved (the conventional R.R.S. type smoke-house is normally equipped with racks of internal width about 42").

Under the conditions employed with discontinuous strip tank coagulation, the width of the milled wet sheet increased with the d.r.c. at standardisation as well as with the depth of latex, and coagulation at 1½ lbs/gall. for 15″ depth of latex or coagulation at 1¼ lbs/gall. with a depth of the latex sufficient to give a 15″ slab using a C.C.C. tank gave wet widths in the range 21″ to 23″ against a figure of 16½″ to 18″ for 1¼ lbs/gall. and 15″ depth of latex. The figure quoted by O'Brien in 1940 is 15″ to 17½″ for 1¼ lbs/gall. and 15″ depth of latex. It would appear therefore that under our conditions attempts to reduce expenditure on this type of coagulation equipment by increasing the depth of latex or by increasing the d.r.c. at standardisation is likely to produce material which is not readily dried on the conventional racks and which, as noted previously, is not easily milled on the conventional milling battery.

It would be appropriate to emphasise that the locally produced R.S.S. sheeting batteries, which are normally only 4 stage batteries, should be maintained in at least a reasonable state of mechanical repair for optimum efficiency, and an example of specky surface with rust was attributed by the Estate concerned to operation with inadequate pressure due to excessive 'wear'.

3.3. Rust on R.S.S.—The Report for 1954 shows that a number of Estates equipped with temporary type R.S.S. facilities, or producing R.S.S. on a temporary basis only, experienced considerable difficulties due to rust. In many cases this rust could be conveniently prevented on the site by a more liberal application of water during and after milling. As the subject of water supply in this connection is not emphasised in the R.R.I.C. standard booklet a limited number of tests have been carried out during the period under review to determine the conditions under which difficulties due to rust production are likely to occur at R.R.I.C. Experiments, where the quantity of water used during and immediately after milling were varied from zero to the normal production figure, failed to show any signs of rust when the dripping time prior to insertion into a hot tunnel type smoke-house was not more than 3 to 4 hours. Similarly, tests whereby the dripping time was prolonged to 24 and 48 hours with the normal amount of water in the milling process failed to show evidence of rust formation in the absence and presence of a number of suggested fungicides. Shortage of coagulating pans and of latex eliminated the possibility of combining the two experiments or of running them simultaneously, and the only tentative conclusions drawn are that the risks of rust at R.R.I.C. under the conditions used seems rather small, in so far that milling with conventional amounts of water or a low effective dripping time seemed to prevent rust. The term effective dripping time is used to emphasise the fact that insertion of milled sheet coagulum into a cold smoke-house should be regarded as an extension of the dripping period. In this connection it should also be noted that examples of rust attributable to an increase in effective dripping time in the sense implied above have recently come to the notice of the Department.

3.4. Smoking and Drying.—Further attention has been given to this subject, particularly during the early part of the year, and this Subsection of the Report is, as usual, subdivided into suitable portions.

(1) Application of Basic Principles: The objectives of the work in this connection are described in the Annual Report for 1954 (p. 20-21) and in the half yearly Report for 1955. The small experimental smoke-house constructed for work under this heading has been employed in the first instance to investigate the relationship between per cent. moisture content (after dripping) of sheet coagulum of thickness range equivalent to about 8 to 14 ozs. per square foot and the time in the unit when the temperature is varied between 105°F and 140°F. All the thicknesses used at one temperature correspond to a single bulk

of latex. While the data must be regarded as preliminary and has not been examined in full detail, the marked influence of quite small variations in thickness at the lower smoking temperatures, *i.e.* about 120°F, is fully confirmed. Under the conditions employed, sheets at a dry thickness of 8 ozs./ft² have been air dried in well under 4 days at 120°F. The data obtained is also of interest in relation to the incidence of blisters at various temperatures, and under the conditions employed with sheets of dry thickness equivalent to 8 to 10.5 ozs./ft² no blistering could be detected at temperatures upto and including 130°F. At 135°F blisters could be seen at some stage of the drying on all the sheets even on those at 8 ozs./ft². At 140°F the blisters show up earlier in the drying cycle than is the case at 135°F, but no very large blisters of the type found in samples submitted in connection with the advisory services were observed. These observations on the occurrence of blisters in air drying are in agreement with the statement in the standard R.R.I.C. booklet that R.R.S. type smoke-houses should not generally be operated above 120-130°F, and it is tentatively concluded that cases of extreme blistering may correspond either to gross overheating for an appreciable length of time or to excessive thickness.

The estimates of the Department for 1956 have been drawn up on the assumption that more time can be given to this subject in 1956 when it should be possible to provide adequate facilities to operate this smoke-house at various controlled per cent. relative humidities independent of the temperature.

(2) Construction and Operation of Temporary Type Smoke-Houses: This subject is mentioned in some detail in the Annual Report for 1954, where comments were made upon the (Gottelier) Helembe temporary type smoke-house and upon the Rambukkanda type smoke-house. During the period under review a limited number of alternative temporary type smoke-houses have been examined including the unit at the Gallawatte Division at Yatadola. The examination of one of these smoke-houses has been particularly interesting. The unit concerned has ground floor internal dimensions of approximately 20′ × 15′ with an outside furnace and a single flue opening in the middle of the central passage. The lowest tier of reapers is approximately 2.5′ from the floor and detailed examination of the temperature gradient inside the unit, mainly in the absence of sheets, shows that at the level of the lower tiers a temperature difference of 10 to 25°F can be found between the central area near the flue opening and the sides of the unit away from the flue opening. At the level of the upper tiers this temperature gradient, in a horizontal plane, is very much smaller. This does not mean that the unit is quite unsuitable for R.S.S. production, but does imply that R.S.S. near the door will be slow drying or alternatively that R.S.S. near the centre may be glossy or blistered. It is understood that in practice a differential drying time of 1-2 days is found with a resultant loss in actual daily capacity. From a theoretical standpoint, the conclusion is that a single central flue opening in the absence of the standard bulking space is not expected to be ideal for a unit of dimensions 20′ × 15′, and it was on this supposition that a multiplicity of flue opening was previously suggested for optimum performance for temporary type units as large as 18′ × 16′. A number of Planting Companies are showing considerable interest in this subject and arrangements are therefore being made to prepare a descriptive article with diagrams for publication in a latter issue of the Quarterly Circulars.

(3) Permanent Type Smoke-Houses R.R.S. Type: The standard medium and large size R.R.S. type smoke-houses are multi-storey buildings with, usually, 2 floors of rubber located above a ground floor bulking chamber containing a fire trolley on wheels. In view of the fact that crops are increasing

as a result of replanting it seemed desirable to ascertain whether the capacity of these buildings could be increased to deal with part at least of these anticipated extra crops. One obvious improvement, if practicable, would be the removal of the internal fire trolley so that the ground floor could be used for smoking. This suggestion by the R.R.I.C. involves the construction of an outside furnace with a network of flues beneath the floor and various designs have been prepared for a limited number of Estates. Unfortunately almost all the Estates for which tentative designs were prepared in 1954 decided that the system was, in effect, too experimental for them; but, during the period under review a limited number of other Estates have shown more interest in this project and it seems likely that provision for modification on this basis may be made in the estimate of some Estates for next year.

To obtain at least a minimum of experience of this subject the small R.R.S. type unit at Nivitigalakele Division of the R.R.I.C. was converted to this system on an experimental basis in 1954. The change-over which was carried out on the Department's votes resulted in a theoretical 56 per cent. increase in the capacity of the building. Only very preliminary information could be obtained in 1954. The first set of tests carried out in the period under review were not entirely satisfactory and, although 95 per cent. to 100 per cent. of the total sheet surface area excluding the thick edges dried in 4 days, blistering occurred in about 3 per cent. of the sheets dried in certain areas of the lowest tiers of the ground floor. Accordingly, a more protracted examination of the influence of the relative sizes of the flue openings on the ground floor and of other relevant variables upon the temperature in various parts of the unit has been carried out and the information obtained strongly suggests that the defects previously encountered in a small number of the sheets can be avoided. Further trials with this converted R.R.S. type unit and possibly with larger commercial units are scheduled for 1956.

(4) Permanent Type Smoke-Houses—R.R.I.M. Tunnel Type: The advantages to be expected with tunnel type smoke-houses are fully described in the various publications of the R.R.I.M. over the period 1937-8 with further comments in Planting Manual No. 9. These smoke-houses are briefly mentioned in various recent publications of the R.R.I.C. and due to difficulties encountered in Ceylon a unit of this type has recently been constructed at R.R.I.C. Experiments carried out to obtain operational data on the performance and relative significance of a number of the process variables are given in the appropriate subsection of the Report for 1954. As a result of these tests the constructional engineering company concerned was requested to make a number of alterations to the unit. Reexamination of the unit after the completion of these alterations continued during parts of the period under review, and on the completion of this work an officer of the Department spent a considerable time at a large commercial Estate giving demonstrations and advice on the principles and procedures involved in the use of tunnel type smoke-houses in Ceylon.

(5) Air Dried Sheet—R.R.I.M. Tunnel Type Smoke-houses: The production of A.D.S. in a tunnel type smoke-house using a direct fired C.C.C. oil burner connected up to the main transverse flue of the smoke-house has been described in the Report for 1954. Attempts to decrease fuel consumption by means of the use of smaller nozzles have not been successful due to the inability of the supplier to offer suitable nozzles.

(6) Sheet Spacing: The possibility of increasing the capacity of conventional smoke-houses by a reduction in the spacing has been briefly mentioned in the Report for 1954. Data obtained in connection with this subject and

with the use of the Guthrie mill have been mentioned above and it is hoped to consider the possibility of closer packing in connection with the 50 lbs. smoke-house at a later stage.

3.5. R.S.S. Bale Coating and Marking Compositions.—For convenience in presentation, the work on this subject is subdivided below into three parts:

(1) General: Reference is made to certain aspects of this subject in the Report for 1954 and it is probably desirable to mention here that, while this subject is of no immediate interest to Estates in so far that all R.S.S. is packed and marked by specialist Packers in Colombo and Galle, serious and protracted complaints against Ceylon's Packers in comparison with competitive Packers could, under certain circumstances, have serious repercussions for the producer also. The general principles to be followed in packing and marking R.S.S. for shipment under R.M.A. rules are outlined in the relevant R.M.A. 'Type Descriptions and Packing Specifications' and in the amendments thereto. Any departure from these rules or from accepted practice therefore requires the prior approval of the R.M.A. or at least of the buyer involved and it has been noted that a limited number of Packers in Ceylon have not always followed the relevant specifications in their entirety. In 1954 the Rubber Commissioner advised the Department that the marks made on R.S.S. bales shipped to China are not invariably legible on arrival, and that sorting according to grades is not always easy in spite of the fact that different colours are employed for different grade numbers. More recently a limited number of Packers selling on the open market have also requested assistance in this matter.

Examination of the literature on this subject and of samples returned from overseas buyers has continued during the period under review and further attention has been given to the possibility of improving both the quality of the coating compositions and of the marking inks, particularly for conditions where Ceylon R.S.S. bales form the bulk of the cargo in a ship's hold rather than only a small part of the total cargo carried.

(2) Coating Compositions: Examination of finished coatings in the Stores of a limited number of Packers suggests that the probable significance of inadequate control over the manufacture of the coating compositions may have escaped the notice of some Packers. It has been presumed that the legibility of bale marks might be seriously impaired if the finished coating readily flakes off or abrades away during transit or is unduly powdery. Accordingly, an appreciable number of bales have been coated in Packers' Stores by the Department following R.M.A. procedures in their entirety and in a limited number of cases the experimental bales have been despatched overseas for the comment. The present indications from the comments available from both the buyers and Packers are that the R.R.I.C. bales made according to R.M.A. specification are a marked improvement over the standard outturn of the Packers involved, suggesting inadequate control etc. during manufacture. A number of Packers have pointed out that the solvent required by the R.M.A. specification, referred to therein as mineral turpentine, is unduly expensive and that cheaper alternatives should be considered. Accordingly the R.R.I.C. has carried out a number of small scale tests comparing varying proportions of powder (talc and whiting chalk of appropriate particle size), binder (crepe solution) and solvent, using as solvent The Shell Co. of Ceylon's low aromatic white spirit (which is stated to meet the R.M.A. specification) and this company's diesoline A.G. which does not meet the R.M.A. specification. Diesoline A.G. appears to be a poor solvent for natural rubber and upto the present it has not been possible to produce a diesoline based coating which is visually as satisfactory with talc or whiting chalk powder as the R.M.A. formulation based

on low aromatic white spirit, although a number of the better diesoline based recipes appeared to be a substantial improvement on the outturn of some Packers. Many of the experiments summarised above will be repeated in 1956 and at the conclusion of these tests the data obtained will be summarised and issued to Packers in the form of an Information Leaflet.

The current R.M.A. 'Type Descriptions and Packing Specifications' adequately describes the permissible filler powders and includes a particle size test, and both talc and English white (Malayan whiting chalk), which is based on calcium carbonate, are approved when supplied according to specification. As far as is known talc is the preferred powder in Ceylon but information received during 1955 suggested that English white of Malayan origin might be available more cheaply, and at the request of certain Packers small scale shipment of bales coated with this material in the R.M.A. formulation were despatched overseas with the assistance of the Department. Reports received from the continental European buyers and manufacturers give no reason to suppose that difficulties should be encountered by the manufacturers in dispersing the filler powder. It is understood that English white of Malayan origin is used more extensively in Malaya and it would appear that this material could be considered as an alternative coating powder in R.M.A. coating compositions in Ceylon. Packers who have had no experience with this material are advised to preserve an experimental approach and not to make large scale shipments without preliminary trials.

(3) Marking Paints: The Annual Report for 1954 (Subsection 3.5 p. 24-25) refers to the work carried out outside Ceylon to improve the quality of R.S.S. bale paints by replacing (*a*) water dispersible stencil inks and (*b*) paints based on natural rubber and pigments by paints incorporating 'penetrating' type dyestuffs in natural rubber solution with and without pigments. The procedures recommended by J.P. and P.K. (R.R.I. of Indonesia) involve the use of rather inflammable solvents and the R.R.I.M. has suggested certain modifications. However even the original R.R.I.M. methods involved the prior milling of the pigments and dyestuffs into the natural rubber and the incorporation of various other additives prior to solution. Attempts to simplify the procedure by elimination of the milling stage by dissolving the rubber and penetrating dyestuff only in a suitable good solvent for natural rubber, *e.g.* low aromatic white spirit, have not so far been entirely successful as the surface colour is not invariably satisfactory. Medium scale tests with improved red paints, which were carried out in 1954 when 100 bales were shipped to China, were not entirely successful primarily for reasons outside the control of the R.R.I.C. A further shipment of 100 bales using the same red paint was made to China during the period under review. In this case larger indentification marks in the form of two red bands round four faces of the bales were employed to facilitate selection of the bales at the port of unloading, but, to date, no report has been received through the Rubber Commissioner. Accordingly two further small scale shipments involving the use of red and of red and black experimental type paints on R.M.A. bale coatings were made to European ports. Both buyers commented favourably upon the clarity and legibility of these marks, but one of the buyers suggested that the red paint penetrated too effectively. Various modifications in the compositions and method of application of the red paint are now under examination with a Colombo Packer.

The incorporation of penetrating type dyestuffs of good quality in the natural rubber marking solutions can improve the adhesion of the paint to the bale coating and to the wrapper sheets, and, by virtue of their penetrating power, these dyestuffs are expected to leave a legible mark on the wrapper in the event of almost complete erasure of the surface film of paint. Present

market procedures in Ceylon suggest that red, black, blue, green and yellow paints will be required. The present red paint is made up with I.C.I. Post Office red 14526 and Waxoline Red OS in the ratio of 4 to 3 in the base formula of Crepe 17, Pepton .5 and solvent about 100 (by volume). Best and Lui of the R.R.I.M. suggest a mixture of I.C.I. Post Office Red 14526 and Waxoline Rhodamine B.S. in the ratio of 4 to .5, but the penetration colour with this mixture was considered more suitable for the T.C.R. mark than for the purpose in mind here. Following the suggestion that the above paint may be too penetrating for certain buyers, alternative compositions and procedures are being examined. However, it is our present view that with poor quality bale coatings the proportion of penetrating type dyestuff should not be reduced to very low amounts. None of the black waxoline dyestuffs tested so far have shown much penetration, and, when used alone or in excess, they tend to give tacky films, particularly on whiting coating compound. The use of carbon black alone tends to give films of rather poor adhesion with a dull surface colour. The present black paint is made up with a mixture of carbon black, a waxoline nigrosine (black) and a waxoline green. The waxoline green penetrates as a deep green almost black colour, which may be satisfactory for most purposes. A tentative blue paint is available but this has not yet been examined commercially. Most of the waxoline type blues tested show either limited or no penetration or a tendency to tackiness.

Section IV.—Blanket and Sole Crepe:

4.1. General.—The volume of advisory work in this Section is still quite considerable and at present shows little signs of decreasing. In general, the major cause of correspondence and visits under this heading is the unexpected appearance of a substantial degree of discolouration in dried laces or in the finished crepes on commercial Estates. While it would be an exaggeration to suggest that the Department can invariably 'pin-point' the process fault involved, it would certainly appear that the advisory visits undertaken and the lengthy reports and suggestions furnished by the Department do generally assist the Estate Staffs involved to initiate steps in the correct direction. In all cases the Estates are earnestly requested to contact the Department a second time if the improvement anticipated is not obtained or maintained. It will no doubt be appreciated that in the absence of a staff capable of carrying out experimental work on these subjects and of the necessary facilities and time, the value of these advisory services would be seriously diminished.

4.2. Coagulation.—The Annual Report for 1954 (Subsection 4.7 p. 28) summarised the earliest preliminary investigations carried out on a small scale to assess the commercial possibilities of oxalic acid as a coagulant in place of acetic and formic acids. The R.R.I.C. is advised that oxalic acid has been used on at least a moderate scale in certain parts of Indonesia. The particular claims made for oxalic acid are that it can give improved colour and colour holding properties, that it can often be employed with RPA.3 without the use of a fractional coagulation and without the use of sodium bisulphite and that, by virtue of the omission of the bisulphite, a marked decrease in drying time might be obtained. Considerable work has been carried out during the period under review to examine a number of these claims in small and medium scale tests at Dartonfield. As the major portion of this work and part of the published literature has been summarised in a recent Information Leaflet, it would appear to be unnecessary to give full details here. Copies of the leaflet were sent to Agency Houses etc. and at a later date to various Estates at the request of the Agents; additional copies are available by reference to the Director R.R.I.C. In general, the Department has concluded that oxalic acid is not likely to be a panacea for all crepe bleaching difficulties. In order to assist Estates to carry

out a number of small scale trials with oxalic acid under their own conditions, the R.R.I.C. purchased about 500 lbs. of this acid for issue gratis to Estates in small lots and more general information should be available at the conclusion of these trials. Up to the present about 15 Estates have been issued with sample lots of oxalic acid and several others have carried out or are in the process of carrying out separate trials on a larger scale.

4.3. Accelerated Fractional Coagulation.—Many, but by no means all, of Ceylon's crepe producing Estates take a small fraction (5-15 per cent.) after the addition of bisulphite prior to the coagulation of the bulk of the latex. In an appreciable number of cases either the time taken to get the fraction to 'come cleanly' or the size of the fraction is excessive, even in the presence of small amounts of acid. The early publications of Philpott, O'Brien and others clearly suggest that the use of standardisation water containing appreciable amounts of calcium can cause difficulties in R.S.S. manufacture due to pre-coagulation of the latex, and more recently workers in Indonesia have suggested that the formation of the first fraction taken in crepe manufacture could be appreciably accelerated by the controlled addition of soluble calcium salts and to a lesser extent by magnesium. Examination of much of the relevant correspondence and literature suggests that (1) the process is not at present employed in Java on a large scale, and that (2) the addition of extra calcium might cause an appreciable acceleration in the discolouration of crepes usually attributed to enzymatic systems and might interfere with the processing properties of the finished rubber. In the latter connection it should be understood that if the added calcium interferes with the processing properties of the finished rubber this method of accelerated fractional coagulation would probably be unsuitable even for sole crepe, unless the trimmings are sold as sole crepe rather than as blanket.

In the absence of adequate information on these subjects with respect to Ceylon, appropriate preliminary trials have been started. The present indications are that latex which, in the absence of any additives, may take up to eighteen hours to give a first fraction can, in the presence of added calcium chloride solution, give a 'clean' fraction in under an hour and from this point of view the process seems quite practicable on a semi-commercial scale (*i.e.* 100 lbs. d.r.c.), provided that a measure of discrimination is employed. Examination of the dried fraction and bulk blanket crepes obtained suggests that the added calcium can cause a measurable degree of cure retardation etc. in A.C.S.1 compound and simple means of overcoming this difficulty are still under examination. For the present Estates have been advised not to consider the use of this process, unless the whole of the latex crepe including the trimmings is sold as sole crepe.

4.4. Milling.—The items of crepe milling machinery purchased on Estate Department votes have been briefly referred to in the Annual Reports for 1953 and 1954 (Subsection 4.2 p. 25-26). The full scale equipment at the R.R.I.C. now includes a 'soft' iron macerating mill, a chilled iron scrap macerating mill and a diamond spiral intermediate macerating mill. In 1954 the depth of the grooving on the latter mill was considerably diminished by the suppliers and in 1955 arrangements have been made on the Department's votes to increase the H.P. of the motors of two of these mills to make them more suitable for prolonged experiments and for other purposes. The estimates for 1956 have been framed on the assumption that the output and characteristics of the products of these mills can be investigated in more detail in 1956, and it is hoped that time will be available to proceed with this subject.

4.5. Bleaching Latex for Crepe Manufacture.—The Report for 1953 (Subsection 4.2) and the 1953 Conference Number of the Quarterly Circulars

mentioned that the importers of RPA.3, Messrs. Mackwoods Ltd., were considering the introduction of RPA.3 Concentrate containing about 82.5 per cent. of active ingredient instead of 36.5 per cent. A limited number of small scale tests with RPA.3 Concentrate were carried out in 1953, but the Report for 1954 noted that, as far as the Department was aware, few Estates had shown much interest in this subject. In 1955 the Department was advised that with effect from 14-7-54 the concentration of active ingredient in RPA.3 Concentrate had been reduced to 71 per cent. so that 2 parts of RPA.3 are approximately equivalent in active ingredient concentration to 1 part of RPA.3 Concentrate. The object of supplying Concentrate is to avoid the shipment of large bulks of inactive kerosene type diluent. RPA.3 Concentrate would be slightly cheaper in terms of active ingredient than RPA.3 standard; but, according to figures recently supplied by the importer, the annual saving made by changing to RPA.3 Concentrate is not expected to exceed about Rs. 150/- per year for an Estate making 1,000 lbs. of latex crepe per day for 300 tapping days per year and using Concentrate equivalent to about 16 ozs. of RPA.3 standard per 1,000 lbs. d.r.c. in latex. The Department has had considerable correspondence on this subject with the importers and with certain Estates and has suggested that a saving of this order might easily be lost even in one day should an Estate carrying stocks of RPA.3 Concentrate and of RPA.3 standard allow them to be muddled. As it seemed possible that the Colombo Agents or the manufacturers of RPA.3 might have good reasons for wishing to accelerate the introduction of RPA.3 Concentrate in place of RPA.3 standard, additional preliminary small scale tests were made on new and old samples of RPA.3 Concentrate during the early parts of the period under review. Much of this work is summarised in the relevant section of the half yearly report. More recently, the importers have agreed that, in effect, the introduction of RPA.3 Concentrate would appear unwarranted at present.

As mentioned above, the advisory services in connection with the use of RPA.3 and with the processing of bleached rubber are still not inconsiderable and various Estates have been visited in connection with their production of discoloured laces or crepes etc.

4.6. Mould on Crepes.—The subjects of (*a*) the prevention of discolouration, attributable to the activity of microorganisms, in or on crepe laces and finished crepes, and of (*b*) the drying and lamination of laces have been referred to in the Annual Reports for 1953 and 1954. During the period under review further samples of chemicals suggested for the prevention of staining in this connection have been received from the manufacturers and tested. In our present opinion not one of these materials really meets the requirements of a suitable and effective fungicide for this purpose.

4.7. Hardness of Sole Crepe.—The Report for 1954 (Subsection 4.6) mentions a complaint of poor wearing qualities against limited quantities of 1/8″ and 3/16″ Ceylon sole crepe from a single Estate. On the basis of information received primarily from our 'associated' organisations, it was tentatively assumed that the hardness of crepe is normally expected to reflect its resistance to spreading during use (unless, perhaps, the content of 'active' copper, manganese, iron, etc. is unduly high), but that hardness may not have been proved to be a reliable guide to overall wearing (as opposed to working) qualities or that, if it has, there is no universally accepted specification limit. From an examination of certain complaint samples the R.R.I.M. appears to consider that the hardness (M50) of good quality crepes should preferably be not less than about 4 Kg/cm^2.

In 1954 various Estates were asked to submit samples of standard production sole crepe for M50 tests by the Department prior to the despatch of

larger samples from selected Estates to Europe for further examination. The M50 values of some of these samples have been redetermined after a period of storage and further samples have been drawn in 1955. The data available are in agreement with the view that Estates are or have been offering sole crepe whose M50 values range from about 3.2 to 7.2 Kg/cm², but there is no evidence available to show that the few Estates supplying samples with M50 values which averaged just under 4.0 Kg/cm² experience any difficulty in placing their sole crepes. Under these circumstances it seemed appropriate to despatch samples of hard and soft (M50 test) sole crepe to Europe to obtain from a shoemaker conclusive evidence to show whether or not the M50 test value is a commercially significant property of sole crepes, and, if so, whether a figure of 4.0 Kg/cm² should be regarded as the lower limit. A sample lot of hard sole crepe (M50 values of subsamples retained at R.R.I.C. all well above 6 Kg/cm²) has been despatched to the L.A.C. and passed to a suitable organisation. Difficulties arising from the transfer of the control of Estates prevented the shipment of samples of soft sole crepe at the same time, and the production of a process for the supply of a soft sole crepe from Dartonfield was more protracted than expected, so that the tests organised in Europe involved the use of a standard commercial sole crepe as control. The full report on the samples is not yet available.

Section 5. Compounded Rubber

5.1. Equipment.—All the equipment ordered in connection with the work on the technical classification of natural rubber has been delivered and erected. Various further repairs have had to be made to the D.C. operated Mooney Viscometer. Much, but not all, of the additional equipment ordered for use under this heading, other than for technical classification purposes, has been received. Additional ageing ovens and the oxygen bomb ordered in connection with the work on the influence of field fungicides have not yet been received.

5.2. Technical Classification of Ceylon's Rubber.—The Annual Reports for 1953 and 1954 and relevant sections of an article in the Quarterly Circulars have summarised certain parts of the semi-technical literature on this subject and have mentioned a number of the possible systems which might be employed for the production of T.C.R. in Ceylon. The R.R.I.M. has continued to function as the main coordinating centre for this subject for S.E. Asia, but, as far as the Department is aware, the commercial position in Ceylon has remained substantially unchanged during the period under review and no immediate large scale production of T.C.R. is anticipated in the near future partly because the bulk of Ceylon's R.S.S. is shipped to China and partly because any large scale commercial production of T.C.R. by Packers—and all or almost all of Ceylon's R.S.S. passes through the hands of Packers—would probably entail expenditure over and above normal, *e.g.* for blended packing. Nevertheless, experimental sampling and testing has continued during the period under review, particularly during the first half of the year, but on a greatly reduced scale compared to previous years. Particular attention has been given to the subject of the production of blended bales and the helpful co-operation of one Packer in Colombo in this connection is gratefully acknowledged. An examination of the practical aspects of 'level changing', and of the possibility of offering the main buyer of Ceylon's R.S.S. experimental lots of relatively uniform blended bales for comparison with lots where the technological uniformity is of a lower order, have both been deferred pending the receipt of reports on samples shipped for other purposes.

5.3. Copper Content of Ceylon's Rubber and the use of Copper Fungicides.—The Reports for 1953 (p. 31) and 1954 (p. 31-32) and the 1953

Conference Paper have all pointed out that the present R.M.A. 'Type Descriptions and Specifications' contain a clause limiting the copper content of all rubbers tendered against any R.M.A. grade to a maximum of 8 p.p.m. During 1953 and 1954 a very small scale survey of the copper content of Ceylon's R.S.S. and latex crepes was carried out leading to the conclusion that little, if any, of the higher grades of R.S.S. and crepe would be expected to show copper contents above 8 p.p.m. However, certain selected pieces from samples of the lowest grades of sheet, R.M.A. # 5, did show copper contents above 8 p.p.m. although this was by no means normal. During the period under review this small survey has been extended to an examination of the copper content of scrap crepe samples collected in the packing houses and at R.R.I.C. While the number of samples of scrap tested is strictly limited, the data obtained are in agreement with the view that the average copper content of the lower grades of scrap crepe may be rather higher than the average value found for best quality R.S.S. There is no reason to suppose that this observation is peculiar to Ceylon alone.

The data summarised above was collected primarily to obtain at least some information showing how far Ceylon's dry rubber exports meet the R.M.A. specification in this connection and to have some background information available in the event of the introduction of a grading system based on copper and/or manganese contents. However, the data is of particular value now that small scale trials with copper based fungicides are being carried out against phytophthora and it will be noted that if the latex rubber and scrap from these experimental areas is to meet the R.M.A. specification the amount of contamination permissible is quite small, particularly in the case of the lower grades of scrap. The position is, of course, complicated by the fact that if the specification is of value to consumers the implication of the specification must almost certainly be that no appreciable part of a lot shipped against R.M.A. grading may exceed 8 p.p.m. in copper and not that the average of the lot shall not exceed 8 p.p.m., so that much localised excessive concentrations of copper would probably be outside the specification. Simple calculation will show the maximum extent of contamination which might be found with the tentative recommendations given by the R.R.I.C. for the use of copper containing fungicidal dusts employed against phytophthora leaf diseases and the Department has had considerable correspondence on this subject during the period under review. The bulk of the comments made are to be found summarised in the Administration's advisory leaflet of 4-5-55. It may be stated here that, where appropriate, every reasonable effort has been made to suggest only limited trials with copper based fungicides in 1955 pending the collection of data showing the extent and seriousness of the contamination and the economic necessity for such treatments under Ceylon conditions.

Considerable attention has been given during the period under review to the literature on the significance of copper in natural rubber and to the use of fungicides containing copper for the control of diseases of the rubber tree. While a consideration of this literature should more appropriately be the subject of a short article in the Quarterly Circulars, it may be noted that the incidence of a fruit rot and/or of a leaf fall attributed to phytophthora has been reported in Ceylon for as early as 1905, 1909 and 1912. Sharples (1915) in Malaya appears to have implied that the use of Bordeaux mixture does not seem to influence the raw rubber; but, Petch (1921) described trials at Peradeniya with Bordeaux mixture, in which copper contents of scrap upto 30 p.p.m. were recorded, and appears to have concluded that further work on the technological properties of the rubber was necessary. The laboratories at the Imperial Institute detected (1925) in certain cases upto 14 p.p.m. of copper in samples drawn one to two days after spraying and concluded that the ageing properties in a rubber sulphur mix of the treated samples could be slightly less

favourable than those of the controls. More recent information, received in the correspondence from Southern India where copper containing fungicidal sprays and to a lesser extent dusts have been used more extensively, seems to imply that difficulties due to the contamination of the latex or scrap rubbers, as judged by the incidence of complaints from local manufacturers or of tackiness on the Estate, can be quite small. Upto the present the Department has been reluctant to accept the view that this information from Southern India may be applied directly to Ceylon conditions without an appreciable number of careful trials (under local conditions). The reasons for this reluctance included the following:—(*a*) the information cannot be readily reconciled, at least with respect to the use of Bordeaux mixture sprays, with all the earlier data, (*b*) there was at the time of the receipt of the information no adequate assurance that specific tests had been carried out on this subject, at least with respect to the use of the more economic procedures based on copper oxychloride dusts, (*c*) as far as was known to the R.R.I.C., the bulk of the rubber produced in Southern India is not sold to R.M.A. specification and probably does not have to be capable of withstanding long term storage, *e.g.* in a stockpile, without appreciable deterioration and (*d*) the extent and time of occurrence of phytophthora leaf fall in Ceylon is less readily predicted than in Southern India, and the distribution and intensity of rainfall between dusting and tapping and between successive tappings, which might reasonably be expected to influence the extent of any contamination, need not necessarily be the same in both rubber growing territories. In addition cases of tacky scraps are known in Southern India although the cause is not clearly defined. In the latter connection it should be understood that, in general, only gross contamination with active copper would be expected to show up in the factory as tackiness under normal short term storage conditions. Accordingly, a considerable programme of experimental work on this subject, involving the examination of samples collected by Estates on dusted (Cuprosana R6 or 4 per cent. Blidust) and on control plots, was initiated in 1955. At the same time latex and scrap samples have been collected at regular intervals from a $1\frac{1}{2}$ acre block near the top of a hill at Dartonfield which has been dusted about once in every ten to fourteen days over a period of four to five months. Samples were also collected from the corresponding drift dusted areas, *i.e.* the areas lower down the slope into which the dust may have drifted. The analysis by the Research Assistant of all the latex total solid films, of the processed latex crepe and of the raw and processed scrap crepe samples for total copper content by the methods approved by the B.S.I. is not yet complete, but the present indications are that the extent of contamination (total copper content)is much less than might be expected and copper contents above 4.8 p.p.m. have not yet been encountered in the processed latex crepes. As it cannot be assumed that the distribution of the copper in the rubbers will necessarily be homogenous or that sampling has taken place in all typical weather conditions, the evidence should not at this stage be construed to imply that large scale dusting will not lead to occasional contamination of the latex although there would at present appear to be little justification for preventing the careful use of fungicidal dusts containing relatively small amounts of copper (*e.g.* Cuprosana R6, 4 per cent. Blidust) on a *restricted experimental scale.* No tests have been carried out to estimate the extent of contamination likely to be found (*a*) when dusting is carried out at the same time as or shortly before tapping, (*b*) when dusting machines are operated in close proximity to the factory or (*c*) when open latex containers, *e.g.* buckets etc., are carried through a recently dusted area, as it has been assumed that such practices would not be permitted under properly supervised commercial conditions. A limited number of small scale tests involving the examination of scrap collected from trees, where 'stationary spot dusting' (*i.e.* keeping the machine stationary and in operation in one place) was carried out, appear to imply that this practice should probably be prohibited.

Since the distribution of copper in the processed raw rubber may not be homogenous and the error in the conventional method of analysis for copper in raw rubber is not inconsiderable, attempts have been made to develop an alternative test procedure which would indicate at least very approximately the proportion of active copper in the samples. The limited tests with the Firestone Rubberscope have not so far suggested that this instrument is necessarily sufficiently sensitive to quite small amounts of extra copper. Ageing tests on specimens cut from vulcanised rubber have certain theoretical objections and are rather lengthy, so that attempts are being made to employ a method involving ageing the rubber before compounding and vulcanising. Procedures of the latter type amply demonstrate that copper oxychloride, as present in commercial dusting powders, is 'active' from the viewpoint of deterioration of the rubber in high temperature accelerated ageing tests, and are being examined in greater details.

5.4. The Use of Certain Organic Fungicides.—During and shortly after the second world war a large number of organic chemicals were tested as fungicides or bactericides in various industries. In the natural rubber producing industry a number of these chemicals have been suggested or investigated for the purpose of suppressing fungal growth in or on crepe and R.S.S. and for minimising the possible effects of bark, panel and leaf diseases of the rubber tree. Thus, the Report for 1952 and 1953 describes certain tests whereby a number of these chemicals were incorporated into latex to determine their value as crepe fungicides and, in general, it was found that although a number of the compounds appeared to give appreciable protection against fungal staining not all of them were effective at low concentration under conditions favourable to mould growth. Further, the relatively good results obtained with large scale sulphur dusting against Oidium in recent years has prompted a number of companies to suggest alternative fungicides at high dilutions with inert fillers or as additives to the sulphur. Similarly, the good canopies obtained after the 1955 wintering together with the exceptionally wet weather in parts of the period under review has prompted certain companies to suggest dusting with some of these new fungicides as preventatives against phytophthora in Ceylon.

During the period under review the Department has had correspondence on many of these subjects particularly with those companies which pursue a very aggressive sales policy in respect of fungicides. In all appropriate cases the Department has emphasised that with an industrial raw material such as natural rubber it is not necessarily sufficient to consider only whether the fungicide is effective for the purpose in mind (without the production of harmful effects on the tree), but that here also attention must be given to the possible adverse influence of these chemicals on the latex rubbers and on the scrap from the area concerned. Some preliminary work, mentioned in the half yearly report (C.P. No. 1907 p. 16-17), has been carried out during the period under review and it is hoped to give further attention to this subject in 1956.

THE REPORT OF THE BOTANICAL DEPARTMENT FOR THE YEAR, 1955

By
C. A. de Silva

SUMMARY

Plant Breeding and Planting Material:

The total acreage on the three estates of the Institute covered by field experiments superivsed by the Botanical Department is approximately 750 acres out of a total of 946 acres of cultivated rubber. The department has also 50 acres of H.P. seedlings and derived 5 tree clones on outside estates.

The pollination programmes undertaken since 1939 have produced a little over 4,700 hand pollinated seedlings which have been planted in the various experimental plantations. Five tree clones have been established from the major proportion of the hand pollinated seedlings. The H.P. seedlings and their five tree derived clones are in most cases planted in adjacent clearings. These areas occupy about 140 acres, all of which are now in tapping.

1100 H.P. seedlings and 1100 five tree clones have been planted on commercial estates. This material is test-tapped at monthly intervals by the field staff of the Botanical Department.

Planting material from foreign countries and local material included in field experiments on crown-budding, large scale clone and seedling trials, "Hedge" planting clone museums, and seed gardens make up the remaining acreage, of 750 acres.

All record books and plans of experimental areas are maintained on a per tree or per plot basis according to the layout of the experiments.

Girth measurements are taken from the second year of growth up to maturity, when the trees are test-tapped once or twice per month. Yield records are then kept, together with information on bark development, incidence of disease, and other secondary characteristics of importance.

All H.P. seedlings are test-tapped which have sufficient trees in each family for useful conclusions on clonal parentage for the production of reliable clonal seed. Early selections are made of high yielding 5 tree clones for further test-tapping. This procedure helps the Botanical Department to keep field recording under the supervision of a single Botanist, with a limited field staff on a workable basis. Final selections of high yielding 5 tree clones for further testing are registered as RLD, (Research Laboratories Dartonfield), clones.

Advisory Work:

A considerable number of letters sent out by the Botanical Department during the period in which the Botanist acted for the Director has been registered under the Director's correspondence.

In general the advisory work of the Botanical division has considerably eased due to the publication of Advisory Circulars on tapping and planting material.

With the successful initiation of the Government Replanting Subsidy Scheme, the major part of the advisory correspondence has been handed over to the Small Holdings Propaganda Officer. This has considerably eased the work of the Botanist.

Correspondence in connection with the distribution of budwood is in the hands of the Estate Superintendent.

Performance of Local Clones:

The following clones have given yields ranging from 18 to 37 pounds dry rubber per tree per year in 1955 based on test-tapping results. These clones compare very favourably with control high yielding clones included in experimental areas.

(1) Clones Nab 12 and 20.

Clone Nab 15 has shown a drop in yield in 1955, but still remains as a high yielding clone with very favourable secondary characteristics.

(2) Clones RLD 9, 13, 16, 22, 28, 29, 31, 33, 36, 37, 39, 40, 41, 42, 45, 46, 47, 48, 50, 59, 74, 75. Budwood of most of the above clones have been multiplied for distribution to commercial estates.

Clones RLD 4, 5, 6 and 7 tested for a second time from an early selection of 120 "three-tree" clones planted in 1935 show very promising yields in the second year of tapping.

Several other RLD clones are in the early years of tapping and final selections can only be made at a later date.

Advisory Circular No. 42A gives a review of the potentialities of local clones, which can be recommended for small scale trials on commercial estates. These RLD clones have been planted in large scale clone trials in monoclonal "observational" plots of 4 to 5 acres each in two or three tapping task on our Hedigalla Estate.

Foreign Clones:

The imported clones RRIM 501, RRIM 513, AVROS 255, PR 107 are all high yielding under local conditions of growth and have been recommended for large scale planting. The best results are obtained by planting the clones in the correct environment, especially with regard to the dryer and more humid areas on estates, and rubber planting districts.

Other clones which can be considered for commercial planting on a smaller scale are clones PB 6/9 PB 5/60 and PB 6/50.

Clone LCB 1320 has given very promising results on our Nivitigalakele Estate. It has been recommended for commercial planting. Clone PB6/9 is rather susceptible to Oidium heveae.

Budwood of the following promising clones in their countries of origin are now in our budwood nurseries. This material will be available to commercial estates in small quantities in 1957.

A selection made from 20 clones received from each of the countries, Malaya, Java, Sumatra and Indochina, are given below:—

Malaya.—RRIM clones 603, 605, 607, 612, 615, 622, 623, for Small Scale Trials. 13 other RRIM clones of the 600 series will be available for trial on a small scale.

Java.—Clones WR 101, GT 1, PR 248, 253, 254, 255, 257, 258, 261. The underlined clones have been planted on a large scale in Java.

Sumatra.—Clones AVROS 427, 385, 529, 1191, 1328, 1447, 1734, 1851. The underlined clones are recommended for large scale planting in Sumatra.

Indochina.—TR 1406, 1542, 1548, 3705. IRCI 2, 3, 6 and 10 are specially recommended.

The other foreign clones, together with those listed above will be tested out in small scale clone trials on Hedigalla Estate, possibly in 1956 if the budwood has developed sufficiently.

Clonal seedlings and Budded Rubber:

Four "types" of clonal seedlings including those of clones Tjir 1 and PB86 are compared with a budded control clone Tjir 1. In the 4th tapping year the yields were as follows:—

	Clonal Seedlings				Budded Clone
	(Selfed) Tjir 1	PB 86	PB 5/139	H.P. seedlings	Tjir 1
1955 yields Lbs/tree/year	8.2	6.2	8.4	10.1	8.0

Clonal seedlings of PB86 are again the poorest yielding in this trial where a stand of 260 trees per acre has been reduced to 160 trees per acre, based on the "Morris-Mann" system of early tapping. The yields of clonal seedlings of (selfed) Tjir 1, PB5/139, and hand pollinated seedlings of special crosses compare very favourably with the yields of the (budded) control clone Tjir 1.

The performance of 'selfed' PB86 seed has been definitely poor according to the information given in Malayan publications, but crossed seed with reliable seed parents have given promising results in areas planted with PB86 hand pollinated seedlings. A limited percentage of such seed is allowed in "mixed clonal seed" approved for large scale planting in Ceylon. PBIG seed can be expected to have a limited percentage of PB86 crossed seed. In most PBIG collections PB86 seed is restricted to 20 per cent.

Crown-Budding:

The crown-budding experiment like many other field experiments on our Hedigalla Estate is on difficult terrain and out of a total of 108 comparisons of budded centre-sections only 88 were tapped in 1955, according to the layout of the experiment. A selection of 6 high and low yielding clones, with sparse and heavy foliage have been used as budded centre sections and budded crowns in a balanced combination.

Budded centre sections crown-budded at a height of 5′ and 8′ show little difference in growth or yield.

There are strong indications that sparse foliage crowns can depress both the growth and yield of high yielding budded centre sections. There are less marked indications of poor yielding crowns of clones, PM 17 and Rubana 393 depressing the yield of high yielding centre sections like clones PB86, Tjir 1, and Glen 1. These preliminary results can only be confirmed, when the complete experiment comes into tappable girth, by a statistical analysis according to the experimental layout.

The clone used for crown-budding cannot change the genetic constitution of the budded centre section. It can only influence the budded centre section in a physiological sense.

'Hedge' Planting Trial 1949 Large Scale Clone Trial:

31 clones are planted on 34½ acres spaced 6′ × 45′ with the 6′ rows approximately along the contours. The 45′ spacing between the rows hardly comes into the category of extreme forms of 'hedge' planting adopted in outside countries.

It is necessary at this stage to distinguish between 'avenue systems' of planting which have a typical spacing of 8′ × 30′, as recommended in this country and the more extreme forms of spacing 50′ and over, which are known as 'hedge' planting systems.

The growth of the better known clones, which have been planted in other areas in the more square planting systems can be usefully compared with the same clones in our 1949 'Hedge' planting experiment. The figures for 1955 are summarised below, when the trees are 6 years of age.

Clone	Average girth in inches 1955	Clone	Average girth in inches 1955
RLD 52	21.8	RRIM 501	16.9 (17.8)
PB 6/50	20.0	RRIM 513	16.9 (17.0)
Nab 17	18.7 (17.9)	RRIM 504	16.8 (17.4)
Nab 20	19.5 (18.2)	LUN. N.	15.7 (17.3)
PB 86	18.3 (16.6)		
		Average for Clearing	17.4

Soil conditions on our Hedigalla Estate are not good compared with most replanted areas and the above figures compare very favourably with the girth figures for the same clones of the same age planted in the more square planted areas which are given in brackets. It should be noted that the average figures for growth in the 'Hedge' planting experiment are based on 150 trees, and those in brackets are based on 20 trees.

The trees in the 'Hedge' planting experiment will be tapped in 1956, and the results should provide very useful information on this system of planting under local conditions of growth.

Limited acreages planted on commercial estates will provide further information in the near future.

The following advantages are claimed for 'Hedge' planting systems on the contour:—

(1) The system is best adapted for selective thinning out at random of high initial stands of 200 trees and over.

(2) Close planting on the contour saves labour costs in tree to tree attention for, manuring, weeding, tapping, bark applications, especially on the difficult rubber planting terrain in Ceylon.

(3) During the early years, when growth is an important factor, 'Hedge' planting systems afford maximum assimilative surface of leaf foliage.

(4) More effective isolation of single trees or areas affected with root disease is possible with 'Hedge' or 'Avenue rows on the contour provided the foci of infection are detected early as they should be by the death of young trees, before side spread is possible with root-contact.

Budgrafting:

(1) Yield results for four years show no differences in yield between budgrafts established from main stem buds and branch buds.

(2) Two series of budgrafts established as "A" and "B" buddings from budwood taken from the highest and lowest trees of the 52 original budgrafts of Mil 3/2, 28 years of age, show no differences in yield in the second year of tapping. Budwood can be propagated from any authenticated tree of a particular clone irrespective of its growth and yield in a particular environment.

Importation of Foreign Clones:

Clones resistant to Dothidella ulei (South American Leaf Disease): A further 8 clones were imported as budwood from the R.R.I.M. at the end of 1955, namely clones FX 4421, FX 2831, F 406, FX 516, FX 273, FX 617, F 1168, F 4542. These have been successfully budgrafted in our nurseries. 17 clones in the same category were imported in 1954 making a total of 25.

New Planting in 1955 on Hedigalla and Nivitigalakele Estates:

Approximately 5 acres each of clones RLD 9, 11, 12, 13, 14, 41, 43, 44, 45, 46, 47, 49, and 50 were planted in new clearings opened at the two experimental stations. Clonal seedlings of the 1953 hand pollination programme and 5 tree clones established from a proportion of these seedlings were also planted in the Hedigalla clearing. The total area planted was about 80 acres.

Clone Trial on Hedigalla Estate:

The clearings planted from 1952 to 1955 cover about 375 acres. These areas consist mainly of large monoclonal blocks of about 5 acres each, which have been planted in keeping with a policy of initiating final trials with "observational" plots on a semi-commercial basis. The planting industry is reluctant to take recommendations based on large clone trials, with a limited acreage of each clone.

The period taken for testing the growth and yield of each clone, and observing secondary characteristics may take up to 20 years or more, and our attempts to minimise the number of such tests for clones which are obviously very high yielding will be appreciated in the future. An excerpt from a recent publication on "Principles and Practice of Field Experimentation" in which statisticians comment on "observational" plots reads as follows:—

"A new method may raise yield so much that the difference has only to be seen to be believed; in such a case it is wasteful to spend time proving the significance of the increase".

Admittedly, more precise methods of experimentation may be necessary in certain instances.

Apart from high yields and vigorous growth, there is the added responsibility of checking clones for secondary characteristics such as resistance to bark and leaf diseases.

DETAILED REPORT

Staff:

Mr. C. A. de Silva, Botanist, acted for the Mycologist from May 1954 to October 1955. Dr. H. E. Young resigned his post as Director in October, 1955. The Botanist was then appointed Acting Director and acted in this capacity up to the end of 1955 in addition to his duties as Botanist.

Mr. L. Wijeyegunewardene, Plant Breeding Officer, was appointed as Superintendent of Dartonfield Estate, and the post was vacant until the appointment of Mr. D. M. Fernando as Assistant Plant Breeding Officer in October 1955.

Mr. L. B. Chandrasekere was on duty throughout the year as Research Assistant.

Mr. W. G. V. Fernando, Laboratory Assistant and Computer was on duty during the year.

Mr. C. Amaracone, Laboratory Assistant continued his work at the Nivitigalakele Station.

The field experiments on Dartonfield, Nivitigalakele and Hedigalla Stations are supervised by Field Assistants and trained sub-staff, who work under the supervision of the Estate Superintendent.

Advisory Work:

The publication of Advisory Circulars on Planting Material has considerably reduced the Advisory correspondence of the department, especially in connection with the Government Replanting Subsidy Scheme. The advisory work for the Middle-class and Small Holders in connection with this scheme is carried out by the Small Holdings Propaganda Officer of the Institute.

Inward correspondence	279
Outward correspondence	189

Visits:

To Estates	16
To Experimental Stations	39
To P.A. Meetings	4
To Colombo	5

The visits were made to Colombo in connection with the exchange of planting material with outside countries.

Visits were made to the Muppane Valley in the Badulla district and to Ratnapura in connection with the land allocation scheme for rubber planting. The inspection was undertaken on behalf of the Director Dr. H. E. Young.

A full report was submitted by the writer to the Land Commissioner on about 8,000 acres inspected during this tour of inspection.

Leave:

Casual	...	...	...	...	13
Vacation	...	...	...	...	12

Publications and Lectures:

(1) Advisory Circular No. 42A.—"New Local Planting Material for Small Scale Trials on Estates".

(2) Combined 3rd and 4th Quarterly Circulars for 1955.—"Recommended Planting Material for 1955".

A lecture on "Planting Material" was given at a meeting of the Galle P.A., on the occasion of a visit by the Minister of Agriculture.

Field Experiments:

The Botanical Department has concentrated its attention mainly on agricultural work in connection with the trial of new planting material, methods of planting, crown-budding, and breeding work for selecting high yielding clones and clonal seedlings. Breeding for resistance to Oidium heveae was also undertaken in collaboration with the Mycological Department.

The growth measurements of new clones and clonal seedlings are taken after the second year of growth up to maturity. Test-tapping is carried out once or twice per month when the trees reach a girth of 18 inches. Yields of the older clearings are calculated in pounds of dry rubber per tree per year, based on 280 tapping days according to the tapping system. For the first three years, tapping is on a half spiral cut once in three days S/2, d/3, 67 per cent.

Approximately 750 acres of experimental areas planted with budded and clonal seedling material are supervised by the Botanist. Early selection of both budded and seedling material from the mature areas in test-tapping enables the department to keep the test-tapping in the various clearings on a workable basis, with the limited field staff available. In 1955 test-tapping was carried out on 6,892 trees on a per tree basis, and statistically laid out experiments were tapped on a plot basis with a total of 108 plots. The planting material test-tapped is distributed over approximately 300 acres. Growth measurements and general observations in the field are carried out in the remaining 450 acres of experimental plantations, which consist of large scale trials with foreign and local clones of the RLD series in large observational plots, which can be tapped on the basis of a tapping task of 250 to 300 trees. The data available from commercial routine tapping will be of considerable value for making a final selection for more precise trials in the future. For a final selection of the best clones for commercial use it is necessary to have vigorous growing trees with outstanding yields, as far as possible with a combination of the most desirable secondary characteristics. These secondary characteristics especially with regard to leaf and bark diseases have to be fully assessed in the various rubber planting districts before general recommendations are made to the planting industry, accordingly the budwood of new foreign and local clones has been distributed to commercial estates in small quantities for purposes of multiplication.

The budwood nurseries are closely supervised by the Botanist and the distribution is attended to by the estate superintendent. The results for the year are presented for the three estates of the institute as in former years:—

Dartonfield Estate

1941 Replanted Area, 6½ acres, Field No. 5:

Five R.R.I.M. clones in monoclonal blocks and a block of mixed clonal seedlings are test-tapped in this area. The yield results from 1952-1955 are presented in Table I.

TABLE I

1941 Replanted Area

Tapped on S/2, d/2, 100%, First tapped in March 1948

Yield in lbs. d.r.c. per tree per year

Clones	RRIM 500	RRIM 501	RRIM 506	RRIM 520	RRIM 514	Clonal seedlings
No. of trees tapped 1955	90-95	88-94	62-77	90-99	100-112	87-97
Yield						
1952	7.2	14.9	8.0	8.7	6.1	8.1
1953	10.6	17.1	14.7	10.6	10.3	11.3
1954	10.6	17.4	10.4	9.7	9.1	11.3
1955	8.8	14.7	9.1	9.8	7.6	10.3

Only clone RRIM 501 is being planted commercially on a large scale. The clone is somewhat susceptible to "Pink Disease", Corticium salmonicolor. The clone should not be planted in low lying areas of an estate, subject to long periods of humid conditions during wet weather periods.

Clonal Seedling Trial, 1947 Area, Field No. 6 Dartonfield:

In this experiment clonal seedlings and clone Tjir 1 are compared for yielding capacity. The clonal seedlings and budded Tjir 1 were planted at an initial density of 260 trees per acre.

Four 'types' of clonal seedlings given below and clone Tjir 1 are replicated eightfold in 30 tree plots after a selective thinning out of poor yielding trees based on the Morris Mann system of early tapping. The final stand was approximately 160 trees per acre.

Planting Material

(1) Selfed seed of clone Tjir 1.

(2) PB86 illegitimate seed crossed with clone Glen 1 and presumably some 'selfed' seed.

(3) PB5/139 seed from Dartonfield Estate, crossed with AVROS 255, BR 2, AVROS 163.

(4) Collection of H.P. seedlings with clone parents Tjir 1, BR 2, AVROS 163, AVROS 225.

The results are presented in Table II.

TABLE II

1947 Replanted Area, Clonal Seed Trial

Tapped S/2, d/2, 100% (1955)
S/2, d/3, 67% (1952-1954)
First tapped in 1952

Planting Material	Yield of clonal seedlings				Tjir 1 Budded Control
	Tjir 1	PB 86	PB 5/139	H.P. seedlings	
"Morris Mann" yields for 5 tappings in grams d.r.c. (July 1951)	24.1	18.2	30.4	29.8	Not tapped
Yield in gms/tree/tapping					
1952	10.0	8.5	14.8	15.1	19.5
1953	15.3	15.2	20.3	21.6	20.2
1954	25.1	18.3	29.4	32.5	27.6
1955	26.5	20.1	27.2	32.6	25.8
In lbs. per tree per year in 1955	8.2	6.2	8.4	10.1	8.0

Tapping system was changed from a 67 per cent. to 100 per cent. intensity on S/2, d/2, 100 per cent. in 1955.

The correlations between the early yields obtained on the Morris Mann system in July 1951 and normal tapping in subsequent years are given below. The correlation in the 4th year of tapping remains satisfactory but shows indications of falling off.

	1952	1953	1954	1955	*Significant (r) (.01) level*
Correlation coefficient (r)	.7585	.6911	.7008	.6019	.4487

Seedlings of clone PB86 are again the poorest yielding in this trial. The yield in itself is by no means unsatisfactory at 6.2 lbs. per tree per year for the type of PB86 seed used. Results given elsewhere in this report of hand pollinated crosses of clone PB86 with reliable clone parents, indicate that mixed seed of this clone could produce seedlings of reliable quality. The yields of "selfed" seed of clone PB86 have been reported on as definitely poor by research workers in Malaya.

The yields of selfed Tjir 1 seed are very satisfactory, compared with the performance of budded Tjir 1 under the conditions of the experiment.

PB5/139 seed and H.P. seedlings with good clonal parentage have given very satisfactory yields, especially the latter.

1950 Replanted Area 23 Acres:

Five tree clones established from a proportion of the 1945 H.P. seedlings were planted in 1950 in this area. Girth measurements taken in December 1955 showed an average girth of 17.7 ins. at 5½ years of age.

1950/51 Replanted Area 5 acres:

This area is an extension of the 1950 area planted with 5 tree clones in May-July 1951. The average girth was 12.5 inches at 4½ years of age which is below standards of normal good growth.

1952 Replanted Area 35 acres—Large Scale Clone Trial:

Clones Nab 12, 15, 20, RRIM 501 and PB 86 are planted in this area in 200 tree plots replicated fourfold. Crown-budding on 100 trees of each plot was carried out in August 1954 at a height of 8 feet with the Oidium resistant clone LCB 870. The following figures and dates give information on the general procedure and the results obtained.

Method of Crown-budding:

	Date
Crown-budded at 8 feet	9-8-54
Successful budgrafts cut back for sprouting ...	7-10-54
Buds started to sprout	8-11-55
Centre section snags were cut back when the shoots showed approx. 4 inches of brown bark	19-5-55 to 15-5-55
All shoots were propped up with a stake tied on the budded centre-section to prevent wind damage up to:	22-6-55

Results:

Total No. of trees crown-budded	1,926
No. successful	1,662 (86.3%)
Total No. lost due to wind damage death of bud-patches and root disease	96
Present stand of successful crown-budded trees	1,566 (81.3%)

The final results are quite successful. The experience gained generally indicates that the crown-budding procedure is by no means easy, and considerable difficulty will be experienced by estates undertaking crown-budding on a large scale, especially on difficult terrain. The period for crown-budding is an important factor for minimising the damage to young crown-budded shoots. The work should be undertaken during an intermonsoonal period, to allow the shoots to mature before the advent of strong winds.

Early results of the effect of the crown on the yields of the centre-sections of budded rubber indicate that crown-budding can be carried out at a height of 6 feet, thus enabling this operation to be carried out from ground level for reducing the cost of crown-budding.

Girth measurements taken one year after crown-budding shows the following rates of growth:—

	Average Girth increase August 1954 *to September* 1955 *in inches*
Crown-budded trees	1.29 inches
Trees not crown-budded	4.46 „

There has been considerable growth retardation in the crown-budded trees in the first year after crown-budding.

This area is planted 9′ × 30′ giving approximately 160 trees per acre the average growth of trees not crown-budded in 3 years and 3 months is **10.9** inches which is quite satisfactory for the avenue planting system.

The experiment affords a comprehensive study of the effect of the low yielding clone LCB 870 as a crown on the budded centre-sections made up of the high yielding clones included in the experiment, namely, Nab 12, 15, 20, PB 86 and RRIM 501.

Nivitigalakele Estate

1939 Clearing, Field 5, 10 acres:

This clone trial originally consisted of 37 clones; test-tapping of a final selection of 4 clones was continued together with 3 clones included as controls. The results are presented in Table III for the last 5 years of tapping.

Tapping is now on renewed bark and three of the Nab clones show satisfactory yields in 1955 compared with the control clones which are being planted on a large scale at the present time. Clone Nab 15 which is a vigorous growing tree, has unfortunately shown a drop in yield.

Nab 12 and 20 are both crooked in growth more so in the latter which is also somewhat susceptible to wind damage. Nab 17 is on further test for a final check up of the high incidence of Brown-Bast during the early years of tapping. Clones Nab 12, 15 and 20 have now been planted out in large scale trials at Dartonfield and Hedigalla estates, and on commercial estates.

TABLE III

1939 Clearing, Field 5, Tapping System S/2, d/2, 100%
Trees first tapped in 1945

Clone	No. of trees tapped 1955	Yield in lbs. d.r.c. per tree per year					Brown Bast cases	Wind damage cases
		1951	1952	1953	1954	1955		
Nab 12	19-18	15.4	17.4	16.9	18.0	20.8	5	1
Nab 15	19-16	14.7	13.6	14.7	16.5	14.3	4	–
Nab 17	19-18	14.2	15.6	16.0	17.1	16.2	9	1
Nab 20	12-10	14.6	18.4	15.6	16.3	18.9	6	5
Controls								
PB 86	20-18	15.3	17.3	17.6	18.3	19.6	3	–
Wag 6278	18-17	8.1	8.5	11.0	12.1	9.5	3	1
Mil 3/2	17-15	11.2	12.5	12.3	12.6	15.3	7	1

1940 Clone Trial, Field 6, 9½ acres:

The foreign clones selected for further trial in this clone trial were test-tapped in 1955. The results for the last 5 years of tapping are presented in Table IV. Clone AVROS 255 is high yielding, but is somewhat susceptible to Brown Bast. The tapping cuts are changed over from year to year, and the sharp fluctuations in alternate years are due to this change over on a number of trees with Brown Bast. The clone should be tapped on a 67 per cent. intensity in the first three years. It is comparatively free of Phytophthora diseases like Bark Rot and Canker, and is therefore useful for planting in the more humid areas of an estate.

Clone RRIM 501 has given the best yield for 1955 and justifies our recommendations for large scale planting of this clone in the dryer areas of an estate as the clone is suceptible to Pink Disease, Corticium salmonicolor.

Clone RLD 1 has again given satisfactory yields of a lower order than the other clones on trial, but it is comparatively free of the undesirable secondary characteristics like Brown Bast and wind damage. It has very good renewed bark.

Clone PR 107 is recommended for large scale planting in its country of origin. It is susceptible to canker of the tapping panel and should be planted in the dryer areas preferably on eastern slopes on the higher elevations of an estate.

Clone RRIM 513 shows a considerably increased yield in 1955 compared with the previous year. Its latex properties with regard to stability and colour are better than those of clone RRIM 501. The clone is not very susceptible to Brown Bast.

TABLE IV

1940 Clone Trial, Field 6, 9½ Acres
Tapped S/2, d/2, 100%
Trees first tapped in January 1947

Clone	No. of trees tapped 1955	Yield in lbs. d.r.c. per tree per year					Brown Bast cases	Wind damage cases
		1951	1952	1953	1954	1955		
RRIM 501	19-18	13.0	13.9	14.7	15.6	17.3	7	5
PB 6/50	21	9.5	9.3	9.8	13.8	15.1	6	2
AVROS 352	16-12	9.5	11.3	12.0	18.0	14.7	8	5
PR 107	23-21	10.5	11.6	11.2	14.1	14.3	3	–
RRIM 513	24-23	9.2	11.1	10.1	11.1	14.3	3	2
AVROS 255	17-16	12.3	15.1	12.8	19.8	13.9	9	6
War 4	24-23	8.7	11.0	10.7	12.1	13.3	4	–
RLD 1	23-22	10.5	12.3	11.1	13.9	12.1	2	–
LUN. N.	21-19	8.9	10.5	11.7	13.4	11.0	5	1
Controls								
Tjir 1	22-21	10.8	7.7	13.6	13.0	12.2	7	1
Wag 6278	22	8.1	9.7	10.6	13.1	10.6	–	2

1941 Clearing, Field No. 8, 7 acres:

The 1939 H.P. seedlings and five tree derived clones from a selection of the seedlings are in test tapping in this clearing. The yield results for the last 5 years are summarised in Tables 5A and 5B.

The clonal seedling families from the crosses of the local clones RLD 8, Wag 6278 and Mil 3/2 have given very satisfactory yields. The family RLD 8 × Mil 3/2 shows a sharp drop in yield in 1955. There are indications of a susceptibility to Brown Bast in this cross. The seedling families with clone Pil A 44 has shown no improvement in yield compared with previous years.

The selected RLD, 5 tree clones for test-tapping show improved yields in 1955, in the 9th year of tapping. All the clones in Table VB have been planted in large scale clone trials in 1954 and 1955 except RLD 51. There has been a considerable demand for these clones from commercial estates for budwood multiplication and small scale trials.

TABLE VA

1941 Clearing Field 8, Tapping System S/2, d/2, 100%

Trees first tapped in 1947

Seedling Family	No. of trees tapped 1955	Yield in lbs. d.r.c. per tree per year					Brown Bast cases	Wind damage cases
		1951	1952	1953	1954	1955		
RLD 8 × Mil 3/2	47-44	11.5	12.2	14.2	16.5	12.6	12	1
RLD 8 × Pil A 44	37-36	8.3	9.0	10.1	11.6	10.9	6	—
Pil A 44 × Wag 6278	18-17	8.7	8.1	10.9	10.6	9.6	1	—
RLD 8 × Wag 6278	40-37	15.6	16.6	19.9	21.5	20.5	6	2
Pil A 44 × RLD 8	15	6.3	6.8	7.3	8.1	7.3	2	—
Control Wag 6278 (budded)	40-39		9.0	11.3	14.1	13.6	2	1

1942 Clearing, Field No. 9, 5 Acres:

Clonal seedling families of the 1940 H.P. seedlings are test tapped in this clearing. Clone Wag 6278 is tapped as a budded control. The yields for the last 5 tapping years are summarised in Table VI.

The local clones RLD 8, and Hil 28 continue to show up as reliable clone parents. Crosses with clone Tjir 1 tend to show up cases of Brown Bast. This has been observed elsewhere with clone Tjir 1 parentage,

TABLE VI

1942 Clearing Field No. 7 tapped S/2, d/2, 100%

Trees first tapped in 1949

Seedling Family	No. of trees tapped 1955	Yield in lb. d.r.c. per tree per year					Brown Bast trees	Wind damage cases
		1951	1952	1953	1954	1955		
RLD 8 × Hil 28	69-68	6.9	7.1	8.5	10.2	10.6	6	1
RLD 8 × Tjir 1	64-61	9.4	10.0	13.2	14.0	14.9	16	4
AVROS 185 illeg	20-19	7.5	8.4	10.6	11.9	12.7	3	1
Wag 6278 (budded control)	63-61	8.4	12.9	9.8	13.1	13.9	4	4
Boundary trees								
RLD 8 × Hil 28	60-59	6.3	6.6	8.9	9.9	10.9	11	2
RLD 8 × Tjir 1	28-26	8.4	9.7	13.8	13.5	14.7	3	6

TABLE VB

1941 Clearing Clone Trial, Field No. 8

Tapping S/2, d/2, 100%

Clone	Seedling Mother tree and family	No. of trees tapped 1955	Yields in lbs. d.r.c. per tree per year					Control clone WG 6278	BB cases	Wind damage cases
			1951	1952	1953	1954	1955			
RLD 9	28, RLD 8 × Mil 3/2 ...	4	13.8	15.7	13.0	19.6	22.6	16.6	1	1
RLD 22	118, RLD 8 × Wag 6278 ...	2	12.4	12.0	16.2	19.2	22.1	13.7	2	1
RLD 13	16, RLD 8 × Mil 3/2 ...	3	13.3	14.2	12.8	17.8	21.3	11.3	2	—
RLD 24	34, RLD 8 × Mil 3/2 ...	5	12.1	11.9	14.5	16.5	21.1	11.0	—	—
RLD 16	43, RLD 8 × Mil 3/2 ...	5-4	13.4	15.5	17.0	18.9	19.7	13.7	1	—
RLD 17	44, RLD 8 × Mil 3/2 ...	4	12.4	14.9	17.4	16.6	18.0	17.4	—	1
RLD 12	31, RLD 8 × Mil 3/2 ...	5-4	11.5	14.3	15.1	16.5	18.4	14.2	1	—
RLD 19	40, RLD 8 × Mil 3/2 ...	4	11.5	13.8	15.9	20.1	18.0	16.7	1	1
RLD 51	39, RLD 8 × Mil 3/2 ...	5	13.9	14.6	17.2	19.2	15.1	8.1	1	—
RLD 21	21, RLD 8 × Mil 3/2 ...	5-4	11.7	12.5	16.1	14.0	15.9	11.7	2	1
RLD 10	50, Mil 3/2 × Wag 6278 ...	5	11.6	14.8	14.9	13.4	15.1	11.3	—	—
RLD 20	41, RLD 8 × Mil 3/2 ...	5	11.6	13.5	14.1	15.5	14.1	7.8	2	—
RLD 23	129, RLD 8 × Wag 6278 ...	5	10.6	12.0	15.6	15.1	14.4	13.5	—	—
RLD 25	36, RLD 8 × Mil 3/2 ...	5	11.3	10.8	13.9	12.9	14.0	16.0	—	—
RLD 18	38, RLD 8 × Mil 3/2 ...	5	10.6	13.2	12.6	14.6	13.2	14.7	1	—
RLD 26	77, RLD 8 × Pil A 44 ...	5	10.3	10.8	10.7	13.9	13.3	12.2	—	—
RLD 14	147, RLD 8 × Wag 6278 ...	5	13.7	13.2	17.1	18.0	12.1	10.2	1	—
RLD 27	91, Pil A 44 × Wag 6278 ...	4	13.3	10.9	9.2	14.9	12.0	8.1	1	—
RLD 11	110, Pil A 44 × Wag 6278 ...	5	10.4	14.6	12.7	16.2	11.0	13.0	—	—

TABLE VII

1944 Clearing, Small Scale Clone Trial

Tapped S/2, d/2, 100%. Trees first tapped in 1951

Clone	Mother tree No. and Seedling Family	No. of trees tapped 1955	Yield in lbs. d.r.c. per tree per year					Control 1955	BB cases	Wind damage cases
			1951	1952	1953	1954	1955			
RLD 45*	96, RLD 8 × Tjir 1 ...	3	7.4	14.7	20.3	24.3	37.3	16.6	—	—
„ 41*	14, „ ...	2	7.3	12.6	16.2	33.2	37.3	10.4	1	—
„ 42*	35, „ ...	3-2	6.8	11.1	14.9	24.7	27.1	10.7	1	—
„ 31*	18, „ ...	3	8.0	10.0	13.6	21.9	25.7	14.7	—	—
„ 28*	115, RLD 8 × Hil 28 ...	2-1	9.7	14.9	15.2	32.0	25.1	15.5	1	2
„ 40*	3, RLD 8 × Hil 28 ...	3	6.4	11.9	15.1	17.9	24.7	12.7	—	—
„ 29*	81, RLD 8 × Hil 28 ...	2	8.0	10.5	15.5	20.4	24.6	19.0	—	1
„ 39	105, RLD 8 × Tjir 1 ...	2	6.9	11.0	14.8	24.8	23.2	12.1	—	1
„ 59	101, RLD 8 × Hil 28 ...	3	7.1	10.9	15.6	17.7	21.2	19.0	—	—
„ 44*	17, RLD 8 × Hil 28 ...	3	5.6	11.9	15.1	19.9	18.4	17.8	—	—
„ 30*	41, RLD 8 × Tjir 1 ...	3	8.8	10.5	14.4	20.2	17.3	10.4		
„ 43*	18, Ill. AVROS 185 ...	2	6.1	10.0	10.1	17.7	14.9	11.7	1	

* Planted in large monoclonal blocks for final trial

1944 Small Scale Clone Trial Field No. 11:

Clones established from the 1940 H.P. seedlings are test tapped in this area as 3 tree clones. The results are presented in Table VII. The better yielding selected RLD clones in this clearing show improved yields for 1955. It should be noted that there are only 3 trees per clone, when the very high yielding clones in this area are compared with the RLD clones which have given high yields with 5 trees per clone in test-tapping in other clearings. Clones RLD 28, 29, 31, 40, 41, 42, 45 are outstanding. There has been a considerable demand for the budwood of these clones from commercial estates in 1955.

1946 Replanted Area, 21 acres, Large Scale Clone Trial, Field 12

A selection of foreign clones are test tapped in 64 tree plots replicated fivefold in a randomised block layout. The results are presented in Table VIII. Clone PR 107 shows a very satisfactory increased yield in 1955 with little Brown Bast. The clone is recommended for large scale planting in the dryer areas. Clone CHM 3 shows a high number of wind damage cases, which makes the clone unpopular for planting on a large scale.

Clone LCB 1320 is also high yielding and is recommended for planting on a fair acreage. Clone AVROS 255 has given very satisfactory yields, but is somewhat susceptible to Brown Bast and wind damage. It is comparatively free of other pathogenic bark diseases and should be tapped for the first 3 years on a reduced intensity of 67 per cent.

Clone PB 5/60 has been recommended for small scale commercial planting, it is comparatively free of Brown Bast and wind damage.

Clone PB6/9 is a vigorous grower and is the best yielding clone in this experiment. It is somewhat susceptible to Brown Bast and wind damage. Owing to its wintering habits the clone can be severely affected with Oidium in a bad year.

TABLE VIII

1946 Large Scale Clone Trial, Field No. 12
First tapped in March 1953.
Tapped on S/2, d/3, 67%
Yield in lbs. d.r.c. per tree per year

Clones	AVROS 255	AVROS 352	PB 6/9	PB 5/60	LCB 1320	CHM 3	Tjir 1	PR 107
Yield 1953	3.9	3.3	6.3	5.7	3.9	3.8	3.9	3.4
„ 1954	6.0	4.9	8.7	5.6	6.0	5.1	4.5	4.7
„ 1955	8.9	6.5	10.7	7.6	8.2	7.6	6.2	7.3
No. of trees tapped	307	285	292	299	300	284	261	289
Mean girth in inches	24.4	22.7	24.9	22.1	24.0	24.0	21.4	21.0
Brown Bast cases	5	1	6	1	1	3	5	1
Wind Damaged cases	12	15	4	2	4	22	5	2

"A" and "B" budgrafts of clone Mil 3/2:

The "A" and "B" series represent budgrafts established from budwood taken of the highest and lowest yielding mature trees of Mil 3/2 planted in 1928.

The "A" and "B" series are planted alternately in the rows in the 1946 clearing. Approximately 60 trees of each series are tapped and the results for 1955 are given in Table IX.

TABLE IX

1946 Clearing "A" and "B" series of clone Mil 3/2

Clone Series	No. of trees tapped	Yield in lbs. d.r.c. tree/year	B.B. cases	Wind damage cases
Mil 3/2 "A"	58-57	7.1	—	4
Mil 3/2 "B"	60-59	7.3	—	—

The results of approximately equivalent yields amply confirm that the budwood from any authenticated tree of a clone retains the hereditary characteristics of the particular clone, irrespective of the conditions of growth and yield of the clone in a particular environment.

1954 Clearing, Small Scale Clone Trial, Nivitigalakele 10 acres:

A selection of foreign clones are planted in this area in 50 tree plots replicated fourfold. The clones are PB 24/51, PB 24/3, PB 28/59, PBT 207, PB 6/5 IRCI 10, IRCI 7, RRIM 501.

This area has been generally supervised by the estate department. Girth measurements will be taken at the end of the second year of growth.

Hedigalla Estate

1943 Clearing, Legitimate Seedling Trial, 4 5/8 Acres:

Seedlings of the 1941 hand pollination programme are planted in this area. The results are presented in Table X. Only the families with over 10 trees in test-tapping are retained for indications of the potentialities of the parent clones as seed parents. All the families show very satisfactory increased yields in 1955.

1943/1944, Five Tree Clone Trial, 14 Acres:

280 five tree clones established from 1941 H.P. seedlings are planted in this area. 48 selected clones were test-tapped in 1945. The results of the better yielding clones, most of which have been given RLD clone numbers are presented in Table XI. A number of the early selections with RLD numbers has given outstanding high yields. The clones planted in large scale clone trials of 4 to 5 acres each are indicated in Table XI.

TABLE X

1943 H.P. Seedling Trial, First Tapped in September 1950 on S/2, d/2, 100%. Yield in lbs. d.r.c. per tree per year.

Seedling Family Cross	No. of trees tapped	Yield				B.B.	B.R.	W.D.
		1952	1953	1954	1955			
RLD 8 × Diy 1	60	7.8	8.4	11.9	14.7	1	4	1
RLD 8 × Tjir 16	14	10.2	9.9	12.4	16.3	—	2	—
Diy 1 × Mil 3/2	15	7.6	7.6	11.0	10.1	1	1	—
Tjir 1 × PB 86 } PB 86 × Tjir 1 }	24	8.1	9.4	11.2	12.8	—	1	—
PB 86 × M 162	14	8.5	9.2	12.3	16.8	1	1	—
PB 86 × PR 107	24	11.8	13.2	18.8	19.0	3	3	1
M 3 (RR 9)× RLD 8	11	6.2	6.0	9.7	11.4	—	—	—
TKD 113 RLD 8	13	—	—	13.7	16.5	1	—	—
Control Wag 6278 Budded	86-70	7.1	6.7	12.8	11.2	1	1	1

TABLE XI

1943 Clearing 5 tree clones, First tapped in September 1950 on S/2, d/2, 100%. Yield in lbs. d.r.c. per tree per year

Clone	Seedling Mother Tree Cross	No. of trees tapped	Yield				B.B.	B.R.	W.D.
			1952	1953	1954	1955			
RLD 75	RLD 8 × Tjir 16 ...	3	11.6	12.3	23.0	30.5	—	—	2
RLD 37*	RLD 8 × Diy 1 ...	3	18.6	15.2	21.7	29.5		1	
RLD 47*	Diy 1 × Mil 3/2 ...	4	13.4	14.5	21.8	26.7	—	—	—
RLD 46*	PB 86 × PR 107 ...	3	15.6	13.5	23.3	25.6		1	
RLD 33*	RLD 8 × Dal 5315 ...	4	15.1	14.0	21.3	24.3	1	—	—
RLD 48	TKD 113 × RLD 8 ...	3	12.7	14.5	19.5	22.9	—	—	1
RLD 76	TKD 113 × RLD 8 ...	4			18.3	21.5	—	—	—
RLD 50*	Tjir 1 × PB 86 ...	4	12.2	12.6	18.6	21.0	—	—	—
RLD 74	PB 86 × PR 107 ...	5	12.0	10.1	18.6	20.7	—	—	—
RLD 36*	PB 86 × PR 107 ...	4	16.9	18.5	29.0	20.6	—	4	
RLD 38	PB 86 × PR 107 ...	5	9.4	10.6	20.3	17.0	—	—	—
RLD 35*	PB 86 × Tjir 1 ...	5	11.1	11.7	18.0	16.2	1	—	—
RLD 32*	RLD 8 × H 24 ...	5	12.6	10.4	13.5	15.5	—	—	—
RLD 34*	RLD 8 × Tjir 16 ...	4	11.4	8.8	11.9	14.4	—	1	—
RLD 49*	Mil 3/2 × Tjir 1 ...	3	12.6	13.7	22.5	9.2	1	—	2
30/18	PB 86 × PR 107 ...	5	11.0	8.3	15.6	20.6	—	4	—
31/9	PB 86 × M 162 ...	5	—	13.2	16.4	20.4	—	—	—
30/26	PB 86 × PR 107 ...	3	—	—	15.9	20.2	—	1	—
7/10	RLD 8 × Diy 1 ...	5	—	—	18.3	19.9	—	—	—
12/1	RLD 8 × Dal 5315 ...	3	12.2	11.0	23.9	19.3	1	—	1
11/3	RLD 8 × PB 86 ...	3	10.9	11.0	12.7	19.0	—	2	—
Wag 6278	(Control Clone) ...	49			12.7	10.3	—	—	1

*Planted in large scale clone trials in 1953 and 1954

1944 Small Scale Clone Trial, Hedigalla.

Test-tapping has been continued in this area on selected clones of the R.R. series established from H.P. seedlings and two Prang Besar "fraction" clones. The results are summarised in Table XII. Clone RR 28 now registered as Clone RLD 52 is of special interest as a shade tolerant clone. In a polyclone area, the clone has a considerable spread, with the lower foliage functioning healthily under dense shade. It is a vigorous grower under most conditions and shows only partial wintering conditions in its 11th year of growth. It will be tried out on high elevations as a partially resistant clone against Oidium heveae. Budwood has been distributed to a number of estates for this purpose.

Studies on the rate of leaf development will be undertaken in 1956. RR 25 is outstanding in its 5th year of tapping. The yields of the Prang Besar clones PB5/122 and 6/5 are very satisfactory compared with the control clone, but do not warrant any special consideration.

The control has 21 trees against the five tree clones tested and shows a drop in yield in 1955.

TABLE XII

1944 Clearing, Small Scale Clone Trial, Hedigalla
Tapped S/2, d/2, 100%. Yield in lbs. d.r.c. per tree per year
Tapping commenced, May 1951

Clone	Yield			
	1952	1953	1954	1955
RR 20	4.6	4.9	7.3	10.2
RR 24	6.5	7.8	13.0	13.8
RR 25	7.5	9.5	13.9	16.9
PB 5/122	7.1	7.6	14.9	13.8
RLD 52	7.2	8.3	13.1	12.7
RR 29	6.4	7.7	12.4	13.8
PB 6/5	10.3	9.1	13.1	13.1
Wag 6278 Control	6.2	6.3	11.8	9.4

1944 Clearing Stem-Branch Budding Experiment 1½ Acres:

The experiment affords a study of bud variation in the main stem and branches of selected H.P. seedling trees. H1 and H2 represent buds from the lower and upper ends of the first branch, while "B" represent true branch buds. The three types of budgrafts of H1, H2 and "B" are replicated fivefold within each of 10 clones giving fifty comparisons. The results for 4 years tapping are presented in Table XIIIB, and the yields of the 10 clones are given in Table XIIIA.

TABLE XIIIA

Yield in lbs. d.r.c. per tree per year, tapped S/2, d/2, 100%,
Trees first tapped May 1951

Clones	1/130	1/5A	2/72	1/3A	2/32	1/1A	2/23	2/63	1/4A	2/108
1952	4.9	5.6	5.8	2.8	6.6	4.8	8.4	6.7	2.6	7.3
1953	4.7	6.3	5.6	3.5	7.0	5.5	9.9	6.5	2.7	7.7
1954	7.0	8.9	9.3	4.6	10.0	7.8	16.9	11.4	3.6	10.1
1955	8.3	10.8	12.0	5.8	12.3	9.2	17.8	11.9	4.6	10.2

TABLE XIIIB

Yield in lbs. d.r.c. per tree per year

Bud Type	1952	1953	1954	1955
H1	5.3	5.9	8.6	10.1
H2	5.7	6.3	9.1	10.4
B	6.0	5.6	9.5	10.5

Only clone 2/23 shows yields of an order worth further consideration. The budgrafts of the three types of buds show no differences in yield. 2,000 clones on test in experimental areas are of the main-stem type established from two year old H.P. seedlings stumped at 2 feet.

1945 Clearing, Crown Budding Experiment, 11¾ Acres:

In this experiment 6 clones are used as budded centre sections and crowns in a balanced combination for a study of the effect of budded crowns on budded centre sections; the 6 clones represent high and low yielding clones with a heavy or sparse canopy of foliage. The results for both growth measurements and yield figures in 1955 are summarised in Tables XIVA and XIVB respectively. Each table represents a single replication, and is made up of 6 clones of budded centre sections of 6 trees each making up a plot of 36 trees. A single crown of each of the 6 clones is crown budded on the 36 trees of each plot. There are six 36 tree plots in each replication. The figures represent a mean of 6 trees in Table XIVA, which are later divided into 3 centre sections budded at a height of 5 feet and 3 centre sections budded at a height of 8 feet in Table XIVB. In this arrangement the figures indicated diagonally are controls, with the budded centre sections with their own crowns.

In Table XIVA the general growth of budded centre sections are poorer with the sparse crowns of clones PM 17 and Glen 1.

TABLE XIVA

1945 Experiment Crown-budding, Hedigalla.
Girth measurements 1955 (in inches)

Budded centre sections		Budded Crowns: Tjir 1	AVROS 256	PM 17	PB 86	Glen 1	Rub 393	Mean increases (1954-55) 8 months
Tjir 1	...	**22.6**	23.6	20.9	23.8	21.1	22.0	2.2
AV 256	...	23.5	**23.8**	20.8	24.0	21.1	22.3	2.4
PM 17	...	22.2	24.1	**19.9**	24.3	21.1	22.3	2.5
PB 86	...	21.8	23.1	19.9	**22.8**	21.5	21.1	2.0
Glen 1	...	23.0	23.8	19.5	22.8	**20.7**	21.9	2.3
Rub 393	...	23.5	25.7	20.8	24.5	21.4	**23.4**	2.5
Means	...	22.8	24.0	20.3	23.7	21.2	22.2	**22.4**
Girth increments 1954/55	...	2.0	2.1	2.5	2.6	2.7	2.1	**2.3**

1955 Girth measurements for heights of crown budding:

			Mean girth in inches
Crown-budding at 5 feet	...	...	22.6
,, at 8 feet	...	...	22.1
Mean girth ...	...	...	22.4

TABLE XIVB

1945 Clearing crown budded area—Hedigalla.
Yields in gm/tree/tapping 1955

Budded Crowns

Budded centre sections		Height of budding	Tjir 1	AVROS 256	PM 17	PB 86	Glen 1	Rub 393	Means
Tjir 1	...	5′	**18.4**	10.9	6.9	25.4	15.3	12.1	14.8
		8′	**17.6**	13.5	5.3	32.0	16.8	13.4	16.4
AV. 256	...	5′	9.6	**6.6**	5.3	15.9	8.9	15.6	10.3
		8′	10.8	**6.4**	6.4	17.0	10.6	13.1	10.7
PM 17	...	5′	13.5	14.2	**10.2**	26.4	14.1	15.1	15.6
		8′	17.6	17.9	**11.8**	25.9	15.6	13.8	17.1
PB 86	...	5′	19.8	19.3	10.5	**27.3**	18.9	13.1	18.2
		8′	21.9	20.7	11.8	**29.2**	21.9	16.3	20.3
Glen 1	...	5′	29.6	21.4	16.2	32.3	**22.3**	19.6	23.6
		8′	25.5	26.4	12.8	31.7	**28.1**	22.4	24.5
Rub 393	...	5′	14.5	10.1	7.7	15.6	9.2	**11.3**	11.4
		8′	12.9	12.0	10.7	13.6	11.7	**12.4**	12.2
Means	...	5′	17.6	13.8	9.5	23.8	14.8	14.5	**15.7**
		8′	17.7	16.1	9.8	24.9	17.4	15.2	**16.9**

The centre sections budded at 5 feet and 8 feet show no differences in girth measurements.

The trees in this experiment were tapped in 1955. Unfortunately owing to the difficult terrain of most of the land under field experiments on our Hedigalla estate, growth in the various plots have not been uniform, and tapping had to be restricted to balanced pairs of 3 tree subplots which were tappable and represented the two heights of crown-budding. Only 88 comparisons were tapped out of a total of 108 in 1955.

It is not possible to work out the results statistically according to the experimental layout at this stage.

There are indications that the yields of a high yielding clone like clone PB86 can be depressed by crown-budding with sparse foliage clones like PM 17 and Rubana 393 used in this trial. While crowns of clone PB 86 have improved the yields of all clones high and low yielding.

The results over the whole experiment indicate little differential effect on the yield of the centre sections by crown-budding at 5′ and 8′, the figures being 15.7 gms and 16.9 grams per tree per tapping respectively; the difference can be expected to be well within the errors of experimentation.

The clone used for crown-budding cannot change the genetic constitution of the budded centre section. It can only influence the centre section in a physiological sense, similar to a stock-scion relationship.

In actual practice crown-budding with a resistant clone like LCB 870 against Oidium heveae, involves a crown which keeps its foliage during the Oidium season against crowns of other clones which are more or less all susceptible to the disease and subsequent defoliation.

1945 Clearing, Clone trial 10½ acres:

Test-tapping was continued in this area in 1955 on RLD clones No's 2 to 7 which were the final selections of 120 three tree clones established from PBIG seedlings in 1935. 25 tree plots of each clone are replicated threefold. The yield figures are summarised in Table XV.

TABLE XV

1945 Clearing, Clone Trial, 10½ Acres.
Tapped S/2, d/3, 67%. First tapped in June, 1953
Yield in lbs. d.r.c. per tree per year.

Clones	RLD 2	RLD 3	RLD 4	RLD 5	RLD 6	RLD 7	Tjir 1
Yield 1954	6.3	4.8	7.4	8.2	6.5	6.8	5.0
Yield 1955	7.0	5.6	8.3	10.3	8.6	9.1	8.3

The clones have yielded very satisfactorily in 1955 on the reduced intensity of 67 per cent. Normally these yields are about 20 per cent. less than those which can be expected from 100 per cent. tapping. Compared with the control clone Tjir 1 which has shown a sharp increase in yield in 1955, clones RLD 5, 6 and 7 are recommended for small scale trial on commercial estates. A fair quantity of budwood has been supplied in 1955.

1946 Clearing, Legitimate seedling Trial, 1943 H.P. Seedlings:

The 1943 hand pollinated seedlings and selected five tree clones established from these seedlings are test-tapped in this area. The yield results of the clonal seedlings and the selected high yielding clones are presented in Table XVIA and XVIB respectively.

TABLE XVIA

1946 Clearing, 1943 H.P. Seedlings.

Tapped S/2, d/3, 67%, Trees first tapped April 1953

Family	No. of trees tapped	Yield in grams/ tree/ tapping	Yield in lbs. per tree per year		Brown Bast cases	Wind damage cases
	1955	1953	1954	1955		
PB 86 × Tjir 1	14	15.4	4.8	5.6	—	—
PB 86 × Mil 3/2	9	23.4	5.6	6.0	—	—
PB 86 × RLD 8	58	23.5	5.8	6.7	1	9
PB 86 × Wag 6278	19	24.8	7.5	8.7	—	1
Tjir 1 Budded control	69	14.4	4.9	5.7	2	9

Strict comparisons between clonal families and the budded control will not be accurate owing to the variation in the numbers of trees tapped; even so the general indications are that crossed seed of clone PB 86 with reliable clone parents is giving very satisfactory yields after 2½ years of tapping. In the above collection of H.P. seedlings, clone PB 86 has crossed well with the

three local clones. Such seed should be available from contact belts between clone PB 86 and local clones on estates.

TABLE XVIB

1946 Clearing, 5 tree clones from 1943 H.P. Seedlings
Tapped S/2, d/3, 67%

Trees Test-tapped in June 1953

Clone	Trees in tapping	Mother Tree Seedling Family	Yield gm/ tree/ tapping 1953	Yield lb/tree/ year		Brown Bast	Wind damage
				1954	1955		
RLD 55	5	PB 86 × Wag 6278	42.1	12.5	16.5	—	—
RLD 54	5	„ × „ „	33.2	9.3	12.8		
RLD 62	5	„ × RLD 8	26.4	8.0	10.7		
RR 240	4	„ × „	29.7	7.6	10.4		1
RLD 57	5	„ × „	33.1	9.1	10.3		
RLD 61	5	„ × „	29.1	9.6	10.1	1	
RR 279	5	„ × Wag 6278	25.6	7.9	9.9		
RR 301	4	„ × Mil 3/2	25.6	6.7	9.8		1
RR 304	2	„ × „	21.5	6.9	9.4		
RLD 53	2	„ × RLD 8	43.1	6.3	9.2		.2
RR 258	5	„ × „	29.5	7.7	9.2		
RR 241	5	„ × „	30.4	6.3	8.9		
RR 299	5	„ × Mil 3/2	26.7	7.8	8.8		
RR 268	5	„ × Wag 6278	22.9	6.6	8.3		
RR 260	5	„ × RLD 8	30.0	7.6	8.0		
RR 233	5	„ × „		5.8	8.0		
RR 229	5	„ × „	21.1	6.5	7.8		
RR 264	5	„ × Wag 6278		6.0	7.7		
RR 257	5	„ × RLD 8	26.0	5.8	7.7		
RR 232	4	„ × „	21.0	6.5	7.6	1	
RR 263	5	„ × „	21.8	6.4	7.5		
RR 296	4	„ × Mil 3/2	23.7	5.7	7.3		1
RR 261	5	„ × RLD 8	24.4	5.6	7.1		
RR 274	5	„ × Wag 6278	21.4	5.7	7.1		
RR 218	5	„ × RLD 8	23.2	6.0	7.0		
RR 272	5	„ × Wag 6278	21.8	6.2	6.9		
RR 286	5	„ × Tjir 1		6.0	6.9		
RLD 56	2	„ × Wag 6278	32.1	5.5	1.9		
Control Tjir 1	96			4.9	5.2		8

The selections of 5 tree clones made in the first year of tapping and registered as RLD clones have been quite successful. Clone RLD 55 is outstanding with 16.5 lbs. per tree per year in the third year of tapping. Clone RLD 56 was badly wind damaged and the surviving 2 trees with brown bast and wind damage have given extremely poor yields.

1946 Clearing, Legitimate seedling Trial, 1944 H.P. Seedlings:

An area in this clearing not planted in 1946, was left over for planting in 1947 with the 1944 H.P. seedlings. 244 "five tree" clones established from these H.P. seedlings were planted in 1947. The seedlings were first test-tapped in 1953 and the clones in 1954 in the 1947 clearing. The results are presented in Tables XVIIA and XVIIB.

The yield figures of PB 86 clonal seedlings representing crosses with a number of local and foreign clones in Table XVIIA are presented in a single group. The average yield of 6.8 lbs. per tree per year, on a reduced tapping

intenstity of 67 per cent. for about 140 seedlings without selective thinning out, is quite satisfactory for the third tapping year. CloneTKD 113, a high yielding Tjikadoe seedling, has crossed well with both local and foreign clones especially with clone PB 5/139, which is known to be a good seed parent from results presented elsewhere in this report.

TABLE XVIIA

1946 Clearing. Legitimate Seedling Families

1944 Hand Pollinations.

Tapped S/2, d/3, 67% Yield in lb. d.r.c. per tree per year

Trees first tapped in 1953.

Family	No. of trees tapped	Yield			BB	BR	WD
		1953	1954	1955			
PB 5/139 × TKD 113	133-147	5.2	8.1	8.4	3	4	
PB 86 × TKD 113	138-142	3.2	5.3	6.8	3	3	
,, × 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	45-47	4.1	7.5	9.1	3		3
,, × RLD 5							
,, × Glen 1							
,, × Hil 28							

TABLE XVIIB

1947 Clearing, Five tree clones from 1944 H.P. Seedlings

Tapped S/2, d/3, 67%, First tapped in June 1954.

Clone No.'s	gms/tree/ tapping 1954	Lbs/tree/ year 1955	Clone No.'s	gms/tree/ tapping 1954	Lbs/tree/ year 1955	Clone No.'s	gms/tree/ tapping 1954	Lbs/tree/ year 1955
RLD 64 (39)	30.7	15.0	28	18.3	6.6	178	15.0	5.2
51	24.6	11.3	263	18.4	6.5	260	16.5	5.2
RLD 65 (82)	30.3	8.6	161	17.2	6.3	188	19.5	5.1
205	20.1	8.5	136	19.8	5.9	172	19.0	5.1
RLD 63 (16)	25.2	8.4	RLD 66 (129)	25.1	5.8	174	16.2	5.0
109	24.1	8.0	135	18.2	5.7	130	23.8	4.9
17	15.0	7.6	134	15.8	5.6	202	15.1	4.9
293	22.4	7.2	85	16.4	5.6	211	18.2	4.9
2	19.1	7.2	359	20.3	5.6	173	21.2	4.8
201	16.9	7.1	159	20.1	5.5	186	16.8	4.8
18	17.6	6.9	256	21.4	5.4	89	17.2	4.6
56	17.2	6.9	192	17.6	5.3	181	—	4.5
33	15.2	6.8	206	16.3	5.2	128	16.2	4.0

The selections of "five-tree" clones in the 1947 clearing made in the first year of tapping have again been quite successful, except perhaps clone RLD 66, which was selected in the first year with a yield of 25.1 gms per tree per tapping. Clone RLD 64 is very promising with a yield of 15 lbs. per tree per year in the second year of tapping. The clones registered in the RLD series have been introduced to our budwood nurseries for multiplication of budwood for further trials, if these are finally selected.

TABLE XVIII

1947 Clearing, Legitimate Seedling Trial, Hedigalla
Yield in gms per tree per tapping, tapped S/2, d/3, 67%

Family Cross	No. of trees tapped in 1955	Yield	
		1954	1955
AV 157 × AV 352	4	—	6.4
AV 163 × AV 255 „ × BR 2 „ × RRIM 519 „ × RRIM 506 „ × Tjir 1 „ × RRIM 514 RRIM 514 × AV 163	363	9.2	15.0
Selfed AV 163	3	—	9.5
BR 2 × Tjir 1 „ × AV 255 „ × RRIM 506 „ × RRIM 514 RRIM 514 × BR 2	170		17.2
PB 5/139 × RRIM 500 „ × RRIM 501 „ × RRIM 504 „ × RRIM 506 RRIM 506 × PB 5/139 PB 5/139 × RRIM 511 „ × RRIM 513 „ × RRIM 518 „ × RRIM 519 „ × RRIM 520 „ × BR 2 „ × KD 2 „ × BD 10 „ × PB 6/50 RRIM 514 × PB 5/139	514	14.7	25.5
PB 86 × AV 163 , × RRIM 519 , × RLD 4 „ × RLD 5 „ × RLD 6 „ × RLD 7 „ × AV 255 „ × AV 352 „ × AV 157 „ × PB 23 „ × RLD 2 „ × PB 86	630	13.6	21.9
Tjir 1 × RRIM 514 „ × RRIM 506 „ × AV 255	232	9.7	16.6
PB 86 Supplies (illeg)	510	8.6	14.4
Tjir 1 Supplies	225	—	10.3
Glen 1 Supplies	35	—	8.9
Mean	2,686		18.5

1947 Clearing, Legitimate Seedling Trial, 1945 Hand Pollinated Seedlings:

The 1945 hand pollination programme was the biggest undertaken by the Botanical Department. Approximately 5000 H.P. seedlings were available for planting. 3,500 seedlings were planted in the 1947 clearing and the remainder were planted on outside estates, willing to co-operate in testing groups of 100 or 200 H.P. seedlings, together with 5 tree clones established from each seedling at the time of planting. About 1/3 of the seedlings in the 1947 clearing were lost due to a severe drought soon after planting at the end of 1947. The vacancies were supplied with "selfed" Tjir 1 seedlings obtained from a 2 acre seed garden with a 2 mile isolation from other rubber areas, and illegitimate seedlings of Clone PB 86.

The results are presented in Table XVIII. It will be seen that both legitimate and illegitimate seedlings have been given a fair test in this clonal seedling trial. A very representative number of crosses with clones AV163, BR 2, PB 5/139 and clone PB 86 shows satisfactory increases in yield in the second year of tapping, tapped on a reduced intensity of 67 per cent. on S/2, d/3. The average yields of PB 86 crossed seedlings of approximately 22 grams per tree per tapping is reassuring.

1949 Clearing, Large Scale Clone Trial with "Hedge" Planting 6′ × 45′, 34½ acres, Hedigalla:

In this clearing 31 clones are tested in 25 tree plots replicated sixfold for each clone in a randomised balanced incomplete block lay out. The planting was completed in July 1949. Girth measurements were taken in August 1955, and the area will be brought into tapping in 1956. The average growth measurements are presented in Table XIX. The growth of clones in this "Hedge" planted area can only be checked reliably with the better known clones already planted in other clearings on the more square systems of planting. The remaining clones are tested for the first time, and do not give us the data for comparison with square planting. Some of these clones may be inherently poor growing.

Clone RLD 52, Nab clones 17, 20, RRIM clones 501, 504, 513, clones PB 86, PB 6/50 and Lun N, have grown quite satisfactorily under the conditions of the trial for 6 years of age compared with their performance in "square planted" areas. The growth of clone RLD 52 is outstanding, and has been selected as a shade loving tree which may, owing to its peculiar wintering and refoliating habit, be found resistant to Oidium heveae. It is a high yielding clone on test as a "five-tree' clone in the 1944 small scale clone trial.

There has been a considerable amount of controversy over the matter of "hedge" planting compared with the less extreme "Avenue" systems and square planting. On difficult rubber planting terrain, such as we have in Ceylon, the close planted rows of trees planted along the contours, almost dead level, affords a method for a considerable saving of labour in tree to tree attention connected with cultivation, manuring disease control and tapping. Planting 8′ × 30′ has been adopted on a large acreage since 1953 in our clone trials. It is known that for purposes of dusting and spraying avenue systems along the contours considerably ease the dusting operation on difficult terrain and makes it more effective. Extreme "Hedge" planting systems are not recommended for stands of rubber well under 200 points per acre, where only a limited amount of selective thinning is called for. In the case of mixed clone seedlings planted at 250 points per acre or over it is necessary to adopt a planting system where, essentially, the trees have to be selectively thinned out at random on growth and yield characteristics to give maximum yields.

Any planting system in which selective thinning has to be sacrificed for spacing defeats the purpose for which an initial high stand of rubber has been adopted and the final yields per acre will not come up to the standard of those from budded rubber. "Hedge" planting systems are better adapted for selective thinning at random of high stands of rubber than square planting. This has been amply demonstrated by research workers in Indonesia. 250 to 300 trees per acre will finally be thinned down at random to 120 to 130 trees per acre by the 4th year of tapping. The thinning out in the early years will be done artificially, and later after the commencement of tapping such thinning out will occur naturally, or may have to be done by cutting out the poorest yielding trees.

The 1949 clearing with a spacing of 6′ × 45′ is an extreme form of "Avenue" planting and hardly comes into the class of "hedge" planting with the rows spaced 50 feet apart or over. The growth and yield figures in this clearing will give us useful information for the future.

The clearing will come into tapping in 1956.

TABLE XIX

1949 Clearing Large Scale Clone Trial. Hedge Planting Hedigalla Mean Girth in inches. Planted July 1949. Measurements taken in August 1955. (6 years old)

Clone	Girth Aug. '55 ins.	Clone	Girth Aug. '55 ins.
*RLD 52	21.8	RR 40	17.3
RR 33	20.8	Dar 38	17.2
*PB 6/50	20.0	*RRIM 501	16.9
*Nab 20	19.5	*RRIM 513	16.9
*Nab 17	18.7	*RRIM 504	16.8
RR 31	18.6	RR 44	16.3
RR 42	18.5	RR 51	16.2
BR 30	18.5	RR 41	16.0
*PB 86	18.3	RR 45	15.7
RR 49	18.3	*Lun N	15.7
RR 46	18.3	RR 34	15.3
Dar 40	18.2	Nab 16	15.3
RR 35	18.2	RR 19	15.1
RR 29	18.1	RR 50	14.4
RR 48	17.7	RR 32	14.3
RR 37	17.3	Mean	17.4

*Clones planted in other trials on "square" planting systems.

1950 Clearing, clone trials, 20 acres, Hedigalla:

There are three small scale clone trials in this area in 25 tree plots replicated three or fourfold. Girth measurements were taken in August 1955 and the results are summarised in Table XXA, B and C.

TABLE XXA

Experiment 1, Planted May, 1951
Mean Girth in Inches

Chaemara Clones	CH 2	CH 3	CH 4	CH 8	CH 26	CH 29	CH 31	CH 32	PB 86	LCB 870	Mean
'54 Dec.	13.6	14.6	12.5	12.1	15.2	12.6	11.8	14.5	14.1	13.2	13.4
'55 Aug.	14.5	15.9	13.5	13.2	17.0	14.5	12.7	15.3	15.6	14.8	14.7

TABLE XXB

Experiment 2, Planted May, 1951
Mean Girth in Inches

Clone	Seedling Mother Tree	1954	1955	1954/1955
DAR 34	Ill. seedling Mil 1/1 DAR	10.5	12.7	2.2
RLD 13	RLD 8 × Mil 3/2	10.7	14.4	3.7
RLD 15	Wag 6278 × Mil 3/2	12.1	14.4	2.3
141/41 N	RLD 8 × Wag 6278 (1941N)	11.2	15.1	3.9
154/41 N	RLD 8 × Wag 6278 (1941N)	9.8	13.4	3.6
RLD 10	Mil 3/2 × Wag 6278	14.7	17.9	3.2
RLD 9	RLD 8 × Mil 3/2	10.8	14.8	4.0
PB 9/82	Controls	9.9	12.0	2.1
LCB 870		11.9	15.8	3.9
PB 86		12.0	15.7	3.7
Mean		11.3	14.6	3.3

TABLE XXC

Experiment III

Planted in July 1951, Mean Girth in Inches

Clone	Seedling Mother Trees	Girth		
		1954	1955	Increase 1954/55
RLD 11	Pil A 44 × Wag 6278	9.6	12.2	2.6
RLD 12	RLD 8 × Mil 3/2	10.0	12.9	2.9
RLD 14	RLD 8 × Wag 6278	10.6	13.2	2.6
RR 38	TKD seedling No. 73, 1935N	8.5	10.7	2.2
RR 39	,, ,, 86 ,,	11.1	14.2	3.1
RR 43	,, ,, 109 ,,	7.0	8.7	1.7
RR 52	PBIG ,, 142 ,,	11.3	14.7	3.4
RR 53	,, ,, 184 ,,	11.6	13.8	2.2
RR 54	,, ,, 197 ,,	10.1	12.2	2.1
DAR 33	Ill. seedling Mil 1/1 DAR	9.9	12.2	2.3
OE 1		7.0	8.5	1.5
PB 86		10.3	13.1	2.8
LCB 870		10.1	13.2	3.1
Mean		9.9	12.3	2.4

In experiment 1 the girth measurements were taken in August 1955, and the growth for 4½ years is satisfactory. No increment figures are given as the period of growth of approximately 7½ months from December 1954 to August, 1955 is the poorer growing period of the year.

In experiment II the girth figures cover a period of 12 months approximately, and the average growth increase for 1954/55 is quite satisfactory.

In Experiment III the growth for a 12 month period is below normal good growing standards in Ceylon. Clone OE 1 from Indo-China shows very poor growth in this particular area.

Large Scale Clone Trials and Seed Gardens:

The following areas planted since 1952, have been generally maintained under the estate department. Manuring and the supplying of vacant points have been carried out with the necessary attention to disease control.

(1) 1952 clearing, 25 acres was planted with 645 five tree clones, established from 1945 H.P. seedlings in the 1947 clearing, Hedigalla Estate. Girth measurements will be presented in an interim report in 1956.

(2) 1953 Large Scale Clone Trial of 96½ acres was planted with clones RLD 1 to 7, clones RRIM 501, LCB 1320, LCB 870, Wag 6278, Mil 3/2 and LUN. N. Girth measurements were due in 1955, but the work was not completed by the end of 1955. The growth figures will be presented in an interim report in 1956. A fair number of cases of root disease has appeared in this clearing.

(3) 1953 clearing seed garden 14½ acres, Hedigalla Estate.

(4) 1954 Clearing, Large Scale Clone Trial, 148 acres, Hedigalla Estate. Approximately 5 acres each of clones RLD 16 to 37 were planted with clones RRIM 501, PB 86, and IRCI 10 as controls. This area also contained 855 H.P. clonal seedlings from the 1952 pollination programme, 106 additional trees of clone PB 86, 232 trees of clone PR 107 and 100 trees of clone AVROS 1301, which is under observation for resistance to Oidium heveae, and is known to be partially resistant to Dothidella ulei (South American Leaf Disease).

1954 Clearing, Nivitigalakele:

An area cleared in 1954 was planted with clones IRCI 7, and 10, PB 6/5, PB 28/59, PBT 207, PB 24/51, PB 24/3, and RRIM 501. 200 trees of each clone were planted in 40 tree plots replicated fivefold.

1955 Clearing, Hedigalla 78 Acres:

Approximately 5½ acres of each of the clones RLD 9, 11, 12, 13, 14, 41, 43, 46, 47, 49 and 50 were planted in this area. Together with these RLD clones, clonal seedlings from the 1953 hand pollinations and 5 tree clones established from selected H.P. seedlings were planted on about 13 acres.

1955 Field Buddings at Nivitigalakele:

RLD clones 44 and 45 were budded in the field in Nivitigalakele in an area planted with illegitimate clonal seed from Sorana Estate by the Estate Department. It was decided that the testing of these special seedlings will not serve any useful purpose.

Hedigalla Estate

The clearings planted with selected material from 1952-1955 cover about 375 acres. These areas mainly consist of monoclonal blocks in approximately 5 acres each, which have been planted in keeping with a policy of initiating final trials with observational plots on a semi-commercial basis. It is possible to test the yields of these plots on the basis of a tapping task, which is a matter of estate routine records on tapping days. Test tapping could also be done once or twice a month by the research staff.

In this country with a variety of growing conditions for rubber it is necessary to try out the selected clones on outside estates in the various planting

districts. A considerable quantity of budwood mostly of RLD clones has been distributed for small scale trials on commercial estates in 1954 and 1955. It has been apparent in the past that the planting industry is reluctant to recognise clones which are tested in small or large scale clone trials on a limited acreage for each clone. The period taken for testing the growth and yield of each clone, and observing secondary characteristics may take up to 20 years, and our attempts to minimise the number of such tests for clones which are obviously very high yielding will be appreciated in the future. An excerpt from a recent publication in which statisticians comment on the principles of field experimentation reads as follows:—

"A new method may raise yield so much that the difference has only to be seen to be believed: in such a case it is wasteful to spend time proving the significance of the increase".

Apart from high yields and good growth there is the added responsibility of checking the clones for secondary characteristics such as resistance to bark and leaf diseases.

1955 Hand Pollination Programme:

A small pollination programme was undertaken with depleted staff in the 1955 season. Although the number of sets were quite satisfactory, pod-rot due to Phytophthora palmivora was serious, due to sustained periods of wet weather during the period of maturing of pods. Out of 283 sets only 69 seeds were available for establishing seedlings in a nursery. 7813 pollinations were carried out and the following crosses survived as nursery plants:—

RRIM 501	× RLD 41
Mil 3/2	× RLD 41
Mil 3/2	× RLD 39
Mil 3/2	× RLD 28
Mil 3/2	× RLD 36
RLD 41	× RLD 42

Budwood Nurseries:

A selection of RLD clones No.'s 1 to 75 have been established in nurseries for supplies of budwood for large scale clone trials in the future.

80 foreign clones obtained from the RRIM, IRCI AVROS, and CPV stations have been successfully established in our nurseries. Some of these will be ready for field trials in 1956.

The following clones will be of special interest to the planting industry:—

Clones: RRIM 603, 605, **612**, 615, 622, 623.
TR 1406, 1542, 1548, IRCI 2, 3, 6, **10**
WR 101, **GT 1**, PR 248, 255, 256, 257, 258, 261;
AVROS **385**, **427**, 529, 1191, 1328, 1447, 1734, 1851.

Budwood of the above clones will be available in 1957.

RRIM 1951 collection:

140 clones representing clones established from seedling material of Hevea species, spruceana, benthamiana and brasiliensis have been successfully established in our nurseries.

Dothidella Resistant Clones:

Seventeen clones were received in January 1955, Clones FX 2784, FX 636, FX 664, FX 360, FX 652, FX 25, F 1619, FB 3363, FX 232, F 351 FB 3300, F 1638, FX 714, FX 4037, F 409, F 4506, F 4537. These have been established in our budwood nurseries. A further 8 clones were received in December 1955 and budded in our nurseries. These were clones FX 4421, FX 2831, F 406, FX 516, FX 273, FX 617, F 1168, F 4542, which will be planted in our budwood nurseries during the next planting season in 1956. We have now 25 Dothidella resistant clones from the RRIM, which were obtained by the institute from Brazil in exchange for 25 RRIM clones and other planting material of oil palm and paddy.

Test-tapping on Commercial Estates:

Test-tapping is carried out on 10 outside estates under the supervision of the Plant Breeding Officer. Each experimental block consists of 100 H.P. seedlings from the 1945 pollination programme and 500 budded trees representing 100 five tree clones established from the 100 seedlings.

For the first time clone LCB 870, which is resistant to Oidium leaf disease has been test-tapped from June to December 1955 under the supervision of the Institute's field staff, on an estate in the wet low country district. A summary of the yield results of 63 trees tapped as a single block is given below:

Total yield in gms. June to December 1955	=	3,304.1
Total No. of tappings	=	499
Yield in gms/tree/tapping	=	6.62
Yield calculated on 100% intensity tapping on S/2, d/2, based on 140 tappings per year	=	2 lbs.

The yield of 2 lbs. per tree per year confirms the poor yielding characteristics of Clone LCB 870.

Clone LCB 870 also has very poor bark characteristics. The average bark thickness of robust grown trees is about 6 mms. The clone can only be used for crown-budding high yielding clones, which are severely attacked by Oidium heveae on high elevations of about 800 feet and over.

The yields of the H.P. seedlings from the 1945 pollination programme are summarised in Table XXI. Seedlings of various crosses of clones PB 5/139, PB 86, RRIM 514, RRIM 506 and AV 163, show very promising yields. The male parents extend over a wide range of foreign and local clones. It is interesting to note that very high yielding crossed seed can be obtained from clone PB 86 with reliable male parents.

TABLE XXI

Yield in gms. per tree per tapping of H.P. seedlings. Year of planting 1947.

Estate No.	Family Cross	Yield in gms 1954	1955	Estate No.	Family Cross	Yield in gms 1954	1955	Estate No.	Family Cross	Yield in gms 1954	1955
7	PB 5/139 × RRIM 520	41.8	56.6	1	PB 5/139 × RRIM 513	24.4	29.0	7	PB 86 × AV 255	30.4	36.2
8	,, × KD 1	33.6	52.9	5	,, × KD 1	25.7	28.9	9	,, × RLD 7	32.9	33.9
2	,, × RRIM 504	50.1	49.4	4*	,, × RRIM 506	—	28.1	2	,, × RRIM 519	29.8	32.8
8	,, × BD 10	36.8	49.2	5	,, × RRIM 519	22.2	27.8	8	,, × AV 157	23.2	31.9
8	,, × RRIM 514	39.9	48.1	9	,, × BR 2	28.2	26.2	9	,, × AV 255	24.8	28.9
8	,, × PB 6/50	43.1	47.2	1	,, × RRIM 518	24.2	25.5	2	,, × RLD 5	22.2	28.7
2	,, × RRIM 506	37.6	44.0	5	,, × BD 10	19.1	23.8	9	,, × RLD 5	25.3	28.0
2	,, × RRIM 520	36.4	39.2	5	,, × RRIM 520	21.2	23.7	8	,, × AV 352	20.8	26.5
3	,, × RRIM 513	35.9	38.8	2	,, × RRIM 513	20.8	22.1	2	,, × RLD 4	23.3	25.7
2	,, × Tjir 1	31.3	35.3	7	PB 86 × RLD 7	49.6	56.7	2	,, × AV 352	21.1	24.7
2	,, × RRIM 501	35.2	34.7	7	,, × RRIM 519	38.6	53.2	2	,, × AV 255	23.3	24.3
4*	,, × RRIM 501	—	33.5	2	,, × AV 157	36.7	49.0	2	,, × AV 163	19.3	19.5
4*	,, × RRIM 500	—	33.1	2	,, × PB 23	28.0	49.0	8	RRIM 514 × PB 5/139	44.6	52.8
9	,, × RRIM 520	28.8	32.1	7	,, × RLD 5	37.1	45.1	4*	,, × BR 2	—	30.5
7	,, × BD 10	31.1	32.1	8	,, × RLD 7	39.7	45.1	3	RRIM 506 × PB 5/139	25.7	29.4
5	,, × Tjir 1	22.8	30.2	8	,, × AV 255	32.4	40.3	6*	AV 163 × RRIM 519	—	20.2
4*	,, × RRIM 504	—	29.8	1	,, × RLD 7	34.9	37.7	6*	,, × RRIM 506	—	18.4
3	,, × RRIM 511	30.6	29.2								

*First year of tapping

TABLE XXII

Yields of selected 5 tree clones established from 47 1945 H.P. seedlings tapped on commercial estates.

Yield in grams per tree per tapping o

Estate No.	Clone No.	Yield in gms. 1954	1955	Estate No.	Clone No.	Yield in gms. 1954	1955
9	RLD 73	64.1	78.1	9	293	47.9	54.0
9	295	56.1	72.6	4*	263	—	53.6
2	RLD 68	56.6	67.9	9	294	55.4	53.1
8	247	47.9	67.7	7	RLD 71	52.3	53.0
8	246	—	65.5	2	227	—	52.1
3	208	57.2	64.0	9	292	54.0	51.2
1	RLD 70	74.2	63.3	9	RLD 72	65.7	50.2
7	277	42.2	61.3	7	275	41.6	49.1
8	245	—	59.1	4*	264	—	48.8
9	299	58.6	58.2	8	248	—	46.6
7	274	50.2	57.1	5	285	51.1	46.6
8	243	—	57.1	4*	267	—	46.3
9	318	—	56.5	9	320	—	45.6
9	319	—	55.8	9	321	—	45.6
3	RLD 67	60.0	54.6	2	214	—	45.5
1	RLD 69	62.5	54.1	8	244	—	45.5
9	317	—	54.0	5	288	52.1	45.3

* Tapped for 10 months. First year of tapping.

Table XXII presents the best yielding 5 tree clones established from seedlings in Table XXI. The selection has been made from approximately 1100 clones test-tapped under the supervision of the Institutes field staff. A few clones introduced to our nurseries at Nivitigalakele as registered RLD clones in 1954 have maintained their high yields in 1955. Further selections for registration as RLD clones will be made during the course of 1956.

REPORT OF THE MYCOLOGY DEPARTMENT FOR THE YEAR 1955

By

O. S. Peries

(*Acting Plant Pathologist*)

SUMMARY

The year under review was an extremely busy one as far as the Mycology Department was concerned. The incidence of Oidium was generally mild again; but this department had to cope with two other types of leaf parasitic fungi (viz. Gloeosporium albo-rubrum and Phytophthora palmivora) which caused rather extensive leaf-falls in certain estates during the early and middle parts of the year. First, the fungus Gloeosporium albo-rubrum made its appearance soon after the Oidium season causing a fall of soft immature leaves. Later in the year attacks of Phytophthora palmivora brought about the fall of mature leaves in many rubber growing areas. The widespread incidence of Gloeosporium and Phytophthora leaf fall is undoubtedly attributable to the abnormally wet weather conditions which prevailed through a major part of the year.

In many cases leaf fall from lower branches due to physiological inactivity, as a result of being fully shaded from sunlight by the dense foliage overhead, was confused with that due to Gloeosporium and Phytophthora.

Bark diseases were prevalent on many estates as a consequence of the sustained wet weather which prevailed during the prolonged South West Monsoon period in 1955. The early incidence of Phytophthora pod and leaf diseases helped to spread the infection. In all cases, however, bark diseases got out of control due to the incorrect use of fungicides and inadequate attention to the primary foci of infection. A comprehensive advisory circular on bark diseases was prepared by the former Director stressing the important points on the early diagnosis of bark diseases and correct fungicidal treatment.

Of the other diseases commonly found on rubber in Ceylon, only Leptoporus (Fomes) lignosus needs comment here. There are indications that this disease will become a major problem very soon if proper precautions are not taken to identify and eradicate this disease at the time of uprooting of the old rubber stands.

Promising results obtained from dusting experiments carried out during the Oidium season, to compare the efficiency of various formulations containing the organic fungicides Karathane and Mildex with that of sulphur for the control of Oidium, have warranted further trials on this subject in 1956. Small scale field experiments were also carried out on the control of Phytophthora by dusting with Cuprosana and Fermspray and on the control of bark-rot with Fermspray (another organic fungicide).

Laboratory work was confined mainly to the examination of diseased specimens sent in from estates. A large number of fungal isolations had to be made to confirm the presence of various parasitic fungi on specimens received.

Preliminary investigations on the control of white root disease, Leptoporus (Fomes) lignosus, by treatment with Sulphur have been completed. Pot experiments indicate that control can be effected by the addition of sulphur to the soil. Further experiments on this subject are now being carried out in the Laboratory and in the field.

Work was started on the isolation of various strains of Rhizobia from root nodules of the different types of legumes now being used as soil covers under rubber. Preliminary studies are being made by the Research Assistant to the Agronomist, who is now completing a post-graduate course at the Waite Agricultural Research Institute, South Australia.

Trials carried out with the new "Hirst Spore Trap" revealed useful indications of a diurnal rhythm in the release of spores of Oidium heveae. This matter will be pursued further during the 1956 Oidium season.

Two types of dusting machines—a prototype of the "Kestrel" and an improved type of the "Toxaver"—were tested out during the year. The former was most promising, but the latter has a number of undesirable features that require attention.

Long term field experiments in connection with the breeding of disease resistant clones and crown budding have been supervised during the year under review.

DETAILED REPORT

GENERAL

Staff:

The Botanist acted for the Mycologist from June 1955 until the former was appointed Acting Director on 6th October, 1955. Mr. O. S. Peries, Technical Assistant to the Director, was then appointed Acting Plant Pathologist and served in that capacity until the arrival of the new Plant Pathologist.

Dr. Alfred Riggenbach was appointed Plant Pathologist and took up duties at the Institute on the 23rd December, 1955.

The Assistant Mycologist, Mr. D. M. Fernando, deferred his end of contract leave, which was due in November 1954, and took charge of the Mycological work during the Oidium season under the general supervision of the Acting Mycologist. The deferred vacation leave of 3 months was availed of from May 1955. Since his return from leave Mr. D. M. Fernando has been attached to the Botany Department.

Messrs. H. L. Munasinghe and E. G. Mendis, Technical Assistants, were on duty throughout the year.

Correspondence:

The Assistant Mycologist handled the correspondence of the Department when he was on duty. This work was generally supervised by the Director and Acting Mycologist. Since May 1955, however, the correspondence has been handled by the acting head of the Department.

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Publications:

The following advisory circulars were prepared by Dr. H. E. Young during the year under review:—

1. "A review of the present Status of Phytophthora Leaf Fall of Hevea in Ceylon"—Advisory Leaflet.

2. "Bark Rot and Canker of the Rubber Tree"—Advisory Circular No. 54.

Miscellaneous:

The Department Staff have spent a great deal of time during the latter half of the year in preparing models and photographs for the Rubber Stall in the 1956 Royal Agricultural and Food Exhibition in Colombo.

Oidium heveae:

The general incidence of Oidium leaf-fall in dusted areas was very mild compared with undusted areas, and the control technique devised in previous years proved to be successful. Oidium is now under good control on estates where the recommended control measures are used. It is now the responsibility of the Estate Superintendents and their principals to ensure that the control methods available are adopted.

Commencement of dusting at the correct time is of paramount importance in the control of Oidium. Dusting should commence when 10 per cent. of the trees in an area show new growth, that is, when green ends are appearing on last years twigs indicating the earliest signs of refoliation and flowering. It is extremely risky to wait till the new leaves are visible. If dusting is delayed until the new leaves are falling due to Oidium infection, it will be too late to protect most of the visible leaflets and the disease will be well established in the field. It must be remembered that sulphur dusting is mainly preventive, not curative.

If wintering is protracted, then spot dusting is necessary at the beginning and at the end of the Oidium season. The man on the spot is in the best position to judge exactly when to commence dusting. A considerable amount of experience and thought are necessary for the correct allocation of the available amounts of sulphur per acre, so that full use is made of this fungicide.

A total of 65 estates sent in returns to the usual questionnaire sent out to estates on the incidence of Oidium. The following table is based on these returns. This information is based purely on observational data, but the differences in response in treated areas can be taken as broadly indicative of clonal susceptibility under various conditions of growth.

Incidence of Oidium 1955:

A—Total number of estates in class for severity
B—Total acreage

	Clone	No infection		Light to medium infection		Severe infection	
		A	B	A	B	A	B
1.	TJ 1	16	1,025	34	2,184	5	77
2.	TJ 16	8	338	23	668	1	21
3.	PB 25	7	142	14	182	1	20
4.	PB 86	16	672	16	530	—	—
5.	BD 5	11	234	17	436	2	30
6.	Glen 1	12	211	15	469	—	—
7.	MK 3/2	7	186	12	442	—	—
8.	PBIG	6	220	5	109	—	—
9.	HC 28	3	36	5	68	—	—
10.	Pil. B 84	4	60	5	217	—	—
11.	WG. 6278	2	10	8	172	—	—

Gloeosporium albo-rubrum:

A limited number of estates reported a "secondary" leaf fall following a good refoliation after sulphur dusting. These attacks were confined to certain areas, where the large soft leaf stage, after successful Oidium control with sulphur, was unfortunately exposed to very wet conditions. This resulted in an attack of Gloeosporium on tender leaves of somewhat larger size as compared with the smaller leaves normally attacked by Oidium.

The symptoms of Gloeosporium attack on the leaves are quite distinct from those of Oidium. Gloeosporium causes a characteristic die-back from the edges and "drip-tip" of the leaves which gives it its common name "rim blight". The more mature affected leaves were not crinkled, and advanced attacks of Gloeosporium showed the characteristic masses of sporebearing layers along the midrib and veins in the form of pinkish pastules visible to the naked eye. In many instances the attacks and leaf fall from Gloeosporium were confined to young leaves on the lower branches which received little or no sunlight, due to a heavy canopy of leaves. In continuous wet weather the foliage on lower branches came in for severe attacks with heavy leaf-fall.

Secondary leaf-fall due to physiological inactivity:

A number of estates reported the defoliation of lower branches, during the continuous wet weather prevailing during the early part of the year. This leaf-fall was often confused with that due to Gloeosporium and Phytophthora. This defoliation was due entirely to physiological factors and was not related in any way to a pathological condition. The leaves on the lower branches were completely cut off from sunlight due to the heavy overhead foliage; the former, therefore, as they did not serve any useful function, turned yellow then brown and finally fell off. The leafless branches in many cases atrophied and died back to the main stem. This type of leaf-fall was particularly noticeable in closely planted areas of young budded and seedling rubber. The loss of a small proportion of leaves from the lower branches following on the heavy foliage resulting from successful Oidium control is of no consequence; and there is no cause for alarm on this account.

Phytophthora palmivora:

The characteristic leaf and pod fall due to Phytophthora attack has been experienced in previous years. It occurs usually about late July, August and September (according to weather conditions). In 1955 the continuous wet weather set in quite early and severe leaf-fall was reported from some estates in June. The rainfall figures for 1955 are given below and the total number of wet days in May and June are significant.

Rainfall figures:

	1955	Average	No. of wet days per month in 1955
January	8.10	7.52	11
February	11.70	5.52	11
March	12.61	10.10	14
April	13.28	13.36	16
May	29.45	26.92	28
June	22.74	17.44	27
July	13.85	12.67	19
August	3.07	11.04	10
September	19.55	13.36	20
October	19.87	18.79	15
November	22.11	18.55	17
December	6.26	10.58	9
Total	182.59	165.85	

The two main factors which favour the incidence and spread of this disease are (1) Wet weather (2) A heavy pod-set.

1. Phytophthora is essentially a wet weather disease. The spores of the fungus are motile in water and wet weather is therefore essential for its propagation. A fair spell of dry weather will bring the activities of the fungus to a standstill and will act as an effective control, until the advent of a further period of wet weather during the susceptible season.

2. In continuous wet weather clones and clonal seedlings with heavy pod-set offer favourable conditions for the development of Phytophthora diseases. The outer coats of the green pods are infected in the first instance and form the main source from which the infection spreads to leaf-stalks and leaves, if the wet weather persists.

In 1955 the continuous rains which set in before the beginning of May were abnormal, and suitable conditions for the spread of Phytophthora on pods and leaves were created quite early in the year.

In the normal S.W. Monsoon season, the continuous rains set in about the end of June, and Phytophthora attacks do not appear till late July.

Phytophthora attacks of any severity on estates are normally confined to restricted areas such as protected sites on western slopes and valleys which remain humid for considerable periods. These localised attacks can be controlled by dusting the susceptible areas, which usually constitute only a small percentage of the total area, with effective fungicides. In 1955, however, the normally susceptible pockets on estates were obscured and general attacks of Phytophthora were experienced over whole estates. The attacks being worst on the heavy pod-setting clones and on old seedling areas as a whole.

During the year tentative recommendations were made for preventive dusting on a small scale with the copper fungicide Cuprosana 6 per cent. at 16 lbs. per acre. This fungicide was selected as it had been used successfully in South India for many years. The organic fungicides of the carbamate series such as Dithane (Parzate) Fermspray (Fermate, Ferbam), have also been suggested for trial on a small scale.

In normal years effective control can be obtained by preventive dusting of the susceptible areas, described above, by commencing the dusting rounds with the first signs of a continuous wet spell in the S.W. Monsoon period.

The possible contamination of latex with copper or carbamates in minute quantities after dusting may adversely affect the properties of the manufactured product. The preliminary examination of manufactured rubber from dusted areas will be carried out by the chemist for dusting recommendations in 1956.

An advisory circular leaflet was sent out by the Director summarising our preliminary views on the incidence and control of Phytophthora leaf and pod diseases.

A number of cases of Phytophthora attack on young plants in the field and nursery were reported. In these cases the fungus attacked leaves and new green shoots. In all cases observed, the attack was arrested by pruning out and destroying all infected material, followed by several rounds of spraying with Perenox at a strength of 4 oz. per 10 gallons of water.

Bark Diseases:

Due to the prolonged wet weather periods experienced during the S.W. Monsoon period, and the incidence of Phytophthora generally on leaves and pods, bark-rot and canker were prevalent on most estates. In some cases canker developed into epidemic proportions. In all cases bark diseases got out of control due to the incorrect use of fungicides and due to inadequate treatment of the primary foci of infection.

A comprehensive advisory circular prepared by Dr. H. E. Young is now available on the subject of bark diseases.

Leptoporus (Fomes) lignosus:

During the year estates and small holders alike sent a number of specimens infected with Leptoporus (Fomes) lignosus for identification. This together with field observations on replanted areas indicate that white root disease can become quite serious in replantings, if it is not identified and eradicated at the time the old rubber stands are uprooted.

Observations have shown that this parasite is often present on the root systems of the old trees although these trees do not show any above ground symptoms of the disease. It is apparent that the old trees can tolerate the fungus without sustaining serious damage. The fact that this is an extremely dangerous condition, is shown by the large number of young plants that succumb to the disease in replantings, where the original stand did not show any symptoms of the disease.

The only method of eradicating this fungus is by examining the root system of all old trees immediately after uprooting, a few hours delay may obscure all signs of the fungus. Wherever the fungus is found, all infected material must be dug up and burnt before the commencement of replanting.

Fomes lamaensis and Ustulina deusta did not cause any damage worth commenting on this year.

Helminthosporium heveae (Bird's eye spot):

This fungus was observed on many nurseries and on young plants in the field, but did not cause damage of any economic importance. Spraying procedure was recommended for its control wherever this was found to be necessary.

Botryodiplodia theobromae:

This fungus was the subject of a number of inquiries during the course of the year. "Diplodia" is a weak parasite and cannot attack healthy vigorously growing shoots. It only causes the characteristic dieback of twigs and branches weakened by the attacks of other strongly parasitic fungi. The control of this disease depends largely on correct agricultural practices which keep the trees in good condition. The fungus can become dangerously parasitic on trees badly devitalised by continuous attacks of Oidium heveae from year to year without sulphur dusting.

Hypocrella reineckiana:

A few inquiries were received about this fungus which is a parasite on scale insects which attack rubber trees. The prominent large orange coloured nodules it produces on the leaves and twigs of the rubber trees do not adversely affect the trees.

Entomological Pests:

Scale insects and mites caused some damage in isolated cases. Cockchafer grub, cutworm, termite and ant attacks were reported from some nurseries.

Caterpillars made sporadic attacks on Pueraria leaves.

A number of extremely effective insecticides are now available for the control of most insect pests, so that no economic damage is anticipated from this source.

Field Experiments

1955 Dusting Experiments:

An experiment was carried out at Dalkeith Estate, Latpandura, under the supervision of the Assistant Mycologist during the Oidium season. The experiment was designed to compare the fungicidal efficiency of organic fungicides based on Dinitro-capryl-phenyl-crotonate (DCPC) with that of Sulphur for the control of Oidium. Karathane or Mildex containing 25 per cent. of the active ingredient, DCPC, was used in 1 per cent. formulations using sulphur as filler. These formulations were then compared with sulphur alone for Oidium control in dusting trials.

Karathane (Mildex) was supplied free of charge for this experiment by Messrs. Mackwoods, Ltd., Colombo.

These preliminary trials did not give any conclusive results with regard to the relative efficiency of the two types of dusts, Karathane and Sulphur. The results based on general observational data and leaf counts on experimental plots in the dusted areas gave indications that Karathane plus sulphur (the formulation containing 1 per cent. DCPC) was just as effective as sulphur dust alone. These observations warrant the further testing of Karathane as a fungicide for the control of Oidium in 1956.

The choice of the two treatments: Karathane + Sulphur, and sulphur dust alone was rather unfortunate, as sulphur is a fungicide with an established reputation for the control of Oidium, so that any differential effect due to the presence of the Karathane in the formulations was difficult to assess. It is hoped that the dusting experiments which will be carried out in 1956 when the efficiency of sulphur dust will be compared with that of Karathane independently, would give more conclusive results regarding the relative merits of these two fungicides. The 1956 experiments are designed with a view to obtaining a direct comparison between sulphur and Karathane. To achieve this, Karathane will be mixed with an inert filler in the formulations which will be used in 1956, unlike the 1955 formulations which contained sulphur as the filler material.

Other dusting experiments under the sponsorship of Messrs. Mackwoods, Ltd., were carried out on five estates. The Mycological Department gave general advice on the layout and experimental procedure and helped in the final assessment of results sent in from these estates.

The economics of dusting with Karathane have still to be clarified. At present Karathane dusts cost twice as much as sulphur. However, the minimum dosage required and the intervals allowable between dustings still remain to be worked out.

An interesting sidelight on the 1955 dusting experiments at Dalkeith Estate was the experience gained in countering Gloeosporium leaf-fall. Gloeosporium is often present on leaves weakened by Oidium, and it was observed that a fair measure of indirect control of the former may be obtained by means of 2 extra rounds of sulphur dusting at the end of the Oidium season. This suggestion may be worth a trial, although sulphur is not a specific fungicide against Gloeosporium. The use of organic fungicides of the "Carbamate" series such as Fermspray (Fermate, Ferbam), Dithane (Parzate), Manzate and Zerlate also gave indications of promise, but the interpretation of observations was complicated by strong boundary effects from sulphur-dusted areas. The wet spraying of fungicides has, however, been found to be generally uneconomical on rubber growing land in this country.

Dusting Machines:

A prototype of the "Kestrel" dusting machine and an "improved" type of the "Toxaver" which was tried out in 1953 were tested during the 1955 dusting season.

The "Kestrel" promises to be a very popular machine. It is a light machine, which can be carried easily by two labourers, and its cost compares well with that of the other machines in use. The prototype was about 92 lbs. in weight and was fitted with a 4 stroke 2 H.P. Villier's engine. The improved "Kestrel" fitted with a 2.2 H.P. B.S.A. engine, is now available in the market. This model weighs 80 lbs. unloaded, and has a hopper capacity of 40 lbs.

The "Toxaver" had some undesirable features, especially a single wheel undercarriage with no arms for transport by labourers. A full report was sent to the local distributors, with suggestions for further improvements.

Another dusting machine which was tested later in the year is the "Mistral II A". The small holdings department using this machine in a co-operative dusting scheme for small holders in 1955 report quite favourably on its performance.

Dusting Trials with Fermspray and Cuprosana 6 per cent.:

Preliminary dusting experiments against Phytophthora leaf and pod diseases were initiated at Dartonfield and Nivitigalakele Estates, under the supervision of the field staff of the Mycology Department. One acre areas with a control were dusted with:

1. 2 per cent. Fermspray dust with an inert filler
2. 6 per cent. Cuprosana dust.

The above fungicidal dusts were applied at the rate of 16 lbs. per round per acre as preventive applications against Phytophthora once in 14 days. The experiment was carried out essentially for testing the manufactured rubber for "copper" or carbamate contamination of latex after dusting, which may adversely affect the properties of manufactured rubber.

Field Trials with the "Hirst Spore Trap":

Field trials were carried out during the Oidium season with a "Hirst Spore Trap"—an automatic volumetric spore trap.

The apparatus consists essentially of a suction pump, worked by a small 4 stroke engine, and a clockwork mechanism which moves a grease-smeared

microscope slide across an orifice through which air is sucked in at a constant rate. Spores entering the trap through the orifice are impacted on the sticky surface of the slide. As the slide is moved at a constant speed of 2 mms per hour and a constant volume of air is sucked in; the spore concentration in the atmosphere at any particular time can be calculated after examining the slide. The apparatus is therefore extremely useful for determining the changes in the spore concentration in the atmosphere at different times of the day.

Preliminary runs were made with the spore trap in order to get acquainted with the working of the apparatus, the preparation of the slides, and the recognition of the various fungal spores on this particular type of mounting (viz. grease). Later studies were concentrated mainly on determining the extent and frequency of changes in the number of Oidium spores in the atmosphere throughout the day, with particular reference to sulphur dusting.

The records made during the Oidium season gave the following preliminary indications:

1. There appears to be a diurnal rhythm which governs the release of spores of Oidium heveae. The most uniform daily concentration of spores being recorded between 11 a.m. and 3 p.m. Deviations from this periodicity were observed, however.

2. The indications are that Relative Humidity and Wind Velocity are correlated with this diurnal rhythm of the release of spores. The spore concentration is at its highest when the Relative Humidity is low and Wind Velocity high, *i.e.* during the mid-day period. Minimal concentrations were observed after sundown and in the early morning periods, when these conditions are reversed.

Mr. O. S. Peries, the Technical Assistant to the Director, supervised these preliminary trials with the "Hirst Spore Trap" under the guidance of the Director. It is hoped that it will be possible to make observations on the changes of spore concentrations in the atmosphere due to changes in Relative Humidity, Wind Velocity, Temperature, and Rainfall together with that due to sulphur dusting during the next Oidium season.

Breeding for Resistance with Clones LCB 870, 1952 Replanted Area, Dartonfield 3 acres:

The girth measurements of the hand-pollinated seedlings in this area planted 5′ × 30′ were taken in May-June 1955. The growth has generally been satisfactory. It is interesting to note that though the material in this area was planted only in "alavango" holes, growth has been generally satisfactory, under the conditions of the experiment, due to systematic manuring every 3 months.

The average girth at a height of 20 inches in June, 1955, was 10.9 inches. The girth figures ranged from 4.5 to 16.8 inches. It will be possible to even out the growth by a preliminary thinning out.

The Morris-Mann system of early tapping was carried out on this area in August-September 1955. The criterion for tappability for this purpose was taken as a girth of 11.5 ins. at a height of 20 ins. The yields obtained during the Morris-Mann system of tapping were extremely low and averaged about 1.6 gms. (range 8 gms. to 0.2 gm.) per tree per tapping. It has therefore been decided that a new criterion, which takes into account the girth as well as the yield of the Plants, should be arrived at for thinning out this area.

1952 Hand Pollinations with Clone LCB 870:

Attention has been given to the seedlings in this area under general estate routine. The area is planted 3′ × 30′ for selective thinning on early growth.

1953 Hand Pollinations with clone LCB 870:

652 of the above H.P. seedlings were planted in the 1954 clearing in the Hedigalla Division. The following seedlings and budgrafts were planted at Hedigalla in 1955:

Clone LCB 870 crosses with high yielding clones—862 seedlings.
Illeg. seedlings of clone LCB 870 "Testatex" classes 1 and 2—23 seedlings.
5 tree clones from 31 LCB 870 crossed seedlings—155 budgrafts.

1948 Clearing Hedigalla, Crown Budding on Twin-Seedlings:

The twin pairs of seedlings in this area were crown-budded at various heights, ranging from 4′ to 8′ with TJ 1 and LCB 870 crowns. The experiment was designed to study two important aspects of crown budding:—

1. The effects of crown-budding with a high yielding crown (clone TJ 1) and a low-yielding crown (Clone LCB 870) on the yields of various seedlings.

2. The effects of crown budding at various heights on the yields of seedlings.

The twin pairs which were of tappable girth were test tapped from April 1955. The available results are summarised in the following tables.

1948 Crown Budded Twin Seedling Area Hedigalla

First tapped in April 1955

Twin Seedlings	Total No. of pairs	No. of pairs tapped	Yields of seedlings in gms/tree/tapping April-December '55	
			TJ 1 Crowns	LCB 870 Crowns
TJ. 1 Illeg. seedlings	41	37	9.1	8.2
PB 86 ,,	45	28	10.4	9.9
Glen 1 ,,	30	20	8.3	6.9
MK 3/2 ,,	53	34	12.1	11.4
WG 6278 ,,	2	1	6.4	3.7
Unselected seedlings	34	16	4.6	5.6
General Mean		136	9.4	8.8
Girth February 1955			20.1	21.7

The preliminary indications are that the twin seedlings with the high yielding crown TJ 1 have given yields of the same order as their opposite twin numbers crown budded with the low yielding Oidium resistant Clone LCB 870. It will be premature to draw any final conclusions from these preliminary test-tapping results.

Summary of yield according to height of crown budding:

Height of Budding	No. of pairs	Yield of seedlings in gms/tree/tapping	
		TJ 1 Crown	LCB 870 Crown
4′	15	7.9	7.6
5′	21	9.3	7.2
6′	15	7.5	8.3
7′	9	9.8	8.7
8′	16	10.1	9.5
General mean	136	9.4	8.8

At this stage the indications are that crown-budding under 8 feet does not adversely affect the yield on the normal tapping panel. Crown-budding is now tentatively recommended at 6 feet. At this height the operation can be performed from ground level.

1954 Clearing Hedigalla (Block H 26¼ acres)

This experiment is intended to try out on a field scale:—

1. Hedge planting of clonal seedlings and subsequent crown budding with LCB 870 with no Oidium control when mature.

2. Hedge planting of budded stumps without crown-budding but with Oidium control when mature.

Planting Material:

4720 selected seedlings
1180 budded stumps of clone AV 255
1180 ,, ,, ,, PR 107

This area would be ready for crown-budding in 1956

Laboratory Experiments:

Sulphur treatment for white root disease (Leptoporus lignosus).

Arising from a report from an outside estate, where an apparent total cure of white root disease of Hevea, Leptoporus (Fomes) lignosus, was effected by incorporating about 4 lbs. of sulphur underground around the affected roots, a preliminary trial was carried out with roots infected with white root disease planted in pots.

The effects of the following treatments were investigated:

1. Various quantities of sulphur were incorporated with 2 cubic feet of soil in the pot.

2. The infected roots were well sprinkled with sulphur dust, but no other sulphur was added to the soil in the pots.

3. Control with no sulphur.

The results of these investigations are summarised below:—

	Pot treatment	pH value on 8-3-55 initial	pH value on 4-7-55 Final	Observations 16-7-55
A	½ lb. sulphur	5.4	2.75	No further development of root disease
B	1 ,, ,,	5.7	2.40	,,
C	2 ,, ,,	5.7	2.55	,,
D	3 ,, ,,	5.8	2.45	,,
E	root sprinkled with sulphur	5.5	4.50	Very little further development
F	Control	5.5	4.90	Further development of fungus up to the rhizomorphic stage

As expected the sulphur caused a change in the acidity of the soil from a low to a high level. There are various implications in this, these and various other aspects of this subject have still to be investigated, especially the effect of the high acidity, resulting from the addition of sulphur, on the growth of the rubber tree.

It will be premature to come to any conclusions from the limited work done on this subject up to the present time.

Diseased Specimens from Estates:

The following diseases and pests were identified on specimens sent to the Mycology Department for examination and report, during the period under review:—

Oidium heveae	5
Gloeosporium alborubrum	7
Phytophthora palmivora	20
Diplodia (Botryodiplodia theobromae) ...	7
Helminthosporium heveae	3
Corticium salmonicolor	2
Leptoporus (Fomes) lignosus	16
Fomes lamaensis	2
Ustulina deusta	1
Ascochyta sp.	1
Hypocrella reineckiana	4
Mites	2
Scale insects	6
Caterpillars and grubs	2
Beetles	1
Caterpillar damage on Pueraria ...	5
Sunscorch	3
Wind damage	2
Water-logging	4
No pathogen	7
Total ...	100

REPORT OF THE AGRONOMY DEPARTMENT FOR THE YEAR 1955.

By

D. H. Constable

General:

The Agronomist was on leave from 1st June to the end of the year. Mr. Jeevaratnam continued on study leave. Consequently work for the last seven months consisted of routine maintenance of manuring experiments together with a full chemical investigation on the two oldest 3 × 3 × 3 NPK experiments and on soils from the various manurial trials. While on leave the Agronomist visited Research Institutes at Fernhurst, Jealott's Hill, East Malling, Long Ashton, Rothamsted and Imperial College of Science and Technology, also Messrs. Micron Sprayers Ltd. Reports on all these visits have been forwarded to the Board. In addition a paper "Hevea Growth Measurements" was presented to the Tropical Section of the 14th International Horticultural Congress at Scheveningen in Holland.

During the first five months it was possible to prosecute the weed-killing trials more vigorously and results of sufficient interest were obtained for the Agency concerned to request much wider scale tests to be carried out in co-operation with one of the weed-killer manufacturers and ourselves.

Staff:

The Agronomist was on 8 months leave with effect from 1st June. Mr. Jeevaratnam continued on study leave for the whole year. At Dr. Piper's request an extension of his study time to April 1956 was approved in order to permit him to carry out certain supplementary investigations indicated by the results of his original work.

At the completion of a year's satisfactory probation Mr. Gunadasa was promoted to the grade of Technical Assistant with effect from 1st June, 1955.

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

Laboratory:

In the field of plant analysis, attention has been concentrated on samples from the two oldest 3 × 3 × 3 NPK experiments, namely Padukka and Nakiadeniya. These have been analysed for Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Iron, Manganese, Copper, Zinc, Boron and Molybdenum, on both leaves and stalks.

A number of soil samples have also been examined as to their citric soluble phosphorus and potassium content, total nitrogen, phosphorus and potassium content, and mechanical constitution before and after treatment with hydrochloric acid.

All this work will be reported in detail elsewhere, and only summary tables are given here.

Table 1 reports Nitrogen contents of leaf and leaf stalk at three samplings January, March and May in 1955. The subscripts 0, ½, 1 and 2 indicate the

TABLE 1

Nitrogen as percentage of dry material

	Leaf				Stalk			
	January	March	May	Average	January	March	May	Average
Padukka								
N_0	3.24	3.15	3.05	3.14	1.14	1.04	.92	1.03
N_1	3.27	3.09	3.29	3.21	1.16	1.04	1.11	1.10
N_2	3.31	3.02	3.32	3.22	1.18	1.13	1.06	1.12
$P_{\frac{1}{2}}$	3.30	3.03	3.21	3.18	1.19	1.09	1.02	1.10
P_1	3.27	3.07	3.18	3.17	1.14	1.07	1.01	1.07
P_2	3.25	3.16	3.28	3.23	1.14	1.08	1.06	1.09
K_0	3.24	3.06	3.18	3.16	1.18	1.04	1.02	1.08
$K_{\frac{1}{2}}$	3.31	3.08	3.22	3.20	1.15	1.08	1.03	1.09
K_1	3.27	3.12	3.26	3.22	1.15	1.10	1.03	1.09
Nakia-deniya								
N_0	2.94	3.08	3.03	3.01	1.00	.99	.89	.96
N_1	3.26	3.24	2.96	3.15	1.05	1.04	.91	1.00
N_2	3.38	3.21	3.16	3.25	1.17	.99	.96	1.04
$P_{\frac{1}{2}}$	3.18	3.08	2.94	3.07	1.05	1.03	.90	.99
P_1	3.15	3.18	3.02	3.11	1.07	.98	.83	.96
P_2	3.25	3.27	3.19	3.24	1.10	1.00	1.02	1.04
K_0	3.15	3.15	3.08	3.13	1.05	1.01	.98	1.01
$K_{\frac{1}{2}}$	3.24	3.20	3.16	3.20	1.05	1.02	.90	.99
K_1	3.20	3.18	2.96	3.11	1.11	.98	.88	.99

TABLE 2

Phosphorus as percentage dry Material

	Leaf				Stalk			
	January	March	May	Average	January	March	May	Average
Padukka								
N_0	.178	.205	.193	.192	.140	.107	.116	.121
N_1	.198	.184	.209	.197	.149	.108	.111	.122
N_2	.195	.204	.202	.200	.175	.112	.120	.135
$P_{\frac{1}{2}}$	.193	.189	.195	.192	.156	.120	.103	.126
P_1	.195	.191	.201	.195	.142	.100	.116	.119
P_2	.184	.211	.208	.202	.165	.107	.128	.133
K_0	.186	.197	.197	.193	.139	.100	.114	.118
$K_{\frac{1}{2}}$	.194	.196	.204	.198	.166	.113	.113	.130
K_1	.191	.199	.205	.198	.158	.114	.119	.130
Nakia-deniya								
N_0	.175	.197	.180	.184	.118	.086	—	.102
N_1	.187	.184	.185	.185	.099	.081	—	.090
N_2	.206	.195	.175	.192	.097	.077	—	.087
$P_{\frac{1}{2}}$	.175	.188	.180	.181	.098	.079	—	.088
P_1	.191	.189	.174	.184	.092	.081	—	.086
P_2	.201	.198	.186	.195	.122	.084	—	.103
K_0	.182	.193	.184	.186	.096	.081	—	.088
$K_{\frac{1}{2}}$	.189	.189	.174	.184	.101	.076	—	.088
K_1	.197	.194	.184	.191	.117	.088	—	.102

level of fertiliser application as referred to the amount of that element given in the standard application of R 4: 6: 5.

We note that on Nakiadeniya increasing nitrogen has a slight effect (7 per cent.) on both leaf and stalk nitrogen.

Table 2 gives data for Phosphorus under the same conditions as Table 1. Effects here do not appear to be significant.

Table 3 gives Potassium data.

Here it is obvious that much greater concentration effects are obtained in the leaf stalk than in the leaf by Potassium manuring. In both estates the level of tissue potassium at Ko application appears satisfactory and there is not a lot of variation from $K\frac{1}{2}$ to K1. This suggests that in the first year half the standard level of K would be adequate.

Table 4 presents data for Magnesium.

The interesting point here is the effect of the Dolomite manuring which took place about the time of the second sampling on both estates. As a result the magnesium tissue content jumped by nearly 100 per cent. It is interesting to note also the decline between January and March even on plots receiving no Potassium (Ko). This shows that there is a general deficiency of soil magnesium and that soil amendments of magnesium are needed regardless of the other manuring.

Table 5 shows Calcium concentrations in tissues. There seems to be no reason for comment here.

Table 6 gives the figures for the trace elements on both estates at the May 1955 sampling only.

The outstanding effects common to both estates are the rapid increase of Manganese and Boron with rising Nitrogen.

This is presumably due to over acidification of the soil by the residual from the sulphate of ammonia used as a nitrogen fertiliser. Also on Padukka the severe decline in Molybdenum with increasing Nitrogen manuring is of importance. These observations may reopen the question of "potash yellowing" since in every case this has been associated with excessive nitrogen manuring. This may have led either to Manganese or Boron toxicity and/or to Molybdenum deficiency, some or all of which may have had an adverse effect on Potash uptake. This aspect will be more intensively studied in the coming year. A number of soil analyses have also been made. Citric acid and hydrochloric acid extractions of soil were done and analysed for potassium and phosphorus. Total (Kjeldahl) nitrogen determinations were also carried out. The results of this work are given in Table 7.

It would appear that citric acid extracts a nearly constant level of potassium from the soil. We know that Epping Forest is very potash deficient and we suspect its neighbouring estate Perth of being the same whereas Kepitigala is very definitely not, nor is Nakiadeniya, while Padukka appears to be in between.

These facts are reflected in the HCl/Potash values and it appears as if this method is worth further investigation.

TABLE 3

Potassium as percentage dry material

	Leaf				*Stalk*		
	January	March	May	Average	March	May	Average
Padukka							
N_0	1.01	1.09	.91	1.00	1.43	1.06	1.25
N_1	1.03	1.00	.86	.96	1.18	1.03	1.20
N_2	1.02	1.04	.86	.97	1.25	.98	1.12
$P_{\frac{1}{2}}$	1.04	1.05	.88	.99	1.29	.96	1.13
P_1	1.00	1.05	.87	.97	1.30	1.07	1.19
P_2	1.01	1.04	.88	.97	1.27	1.03	1.15
K_0	.88	.85	.72	.82	.91	.80	.85
$K_{\frac{1}{2}}$	1.08	1.10	.93	1.04	1.43	1.08	1.26
K_1	1.09	1.18	.99	1.09	1.52	1.19	1.36
Nakia-deniya							
N_0	1.24	1.17	1.11	1.17	1.57	1.26	1.42
N_1	1.08	1.09	1.05	1.07	1.28	1.25	1.27
N_2	1.08	1.10	1.07	1.08	1.25	1.22	1.24
$P_{\frac{1}{2}}$	1.08	1.12	1.08	1.09	1.39	1.22	1.31
P_1	1.16	1.11	1.05	1.11	1.31	1.25	1.28
P_2	1.17	1.14	1.09	1.13	1.39	1.28	1.34
K_0	1.05	.97	.93	.98	1.08	.95	1.02
$K_{\frac{1}{2}}$	1.17	1.19	1.14	1.17	1.42	1.36	1.39
K_1	1.18	1.21	1.16	1.18	1.60	1.43	1.52

TABLE 4

Magnesium as percentage dry material

	Leaf				Stalk		
	January	March	May	Average	March	May	Average
Padukka							
N_0	.15	.13	.20	.16	.14	.27	.21
N_1	.15	.12	.20	.16	.15	.26	.21
N_2	.16	.13	.18	.16	.13	.23	.18
$P_{\frac{1}{2}}$	.16	.14	.19	.16	.15	.24	.20
P_1	.12	.11	.19	.14	.13	.24	.19
P_2	.17	.12	.21	.17	.14	.29	.22
K_0	.17	.13	.22	.17	.16	.32	.24
$K_{\frac{1}{2}}$	.15	.12	.18	.15	.13	.22	.18
K_1	.14	.12	.18	.15	.13	.23	.18
Nakia-deniya							
N_0	.13	.11	.23	.16	.098	.20	.15
N_1	.15	.12	.22	.16	.13	.16	.20
N_2	.18	.12	.22	.17	.13	.20	.17
$P_{\frac{1}{2}}$	.15	.12	.23	.17	.11	.20	.16
P_1	.14	.11	.22	.16	.13	.19	.16
P_2	.16	.12	.23	.17	.13	.18	.16
K_0	.15	.12	.25	.17	.12	.18	.15
$K_{\frac{1}{2}}$	.17	.12	.23	.17	.14	.22	.18
K_2	.13	.098	.20	.14	.12	.16	.14

TABLE 5

Calcium as percentage dry material
May Sampling

Padukka	Leaf	Stalk	Nakiadeniya	Leaf	Stalk
N_0	1.16	.91	N_0	.80	.93
N_1	1.34	.97	N_1	.79	.91
N_2	1.30	1.03	N_2	.85	.98
$P_{\frac{1}{2}}$	1.19	.96	$P_{\frac{1}{2}}$	.81	.99
P_1	1.24	.95	P_1	.86	.92
P_2	1.35	1.00	P_2	.77	.90
K_0	1.33	1.05	K_0	.84	.94
$K_{\frac{1}{2}}$	1.23	.93	$K_{\frac{1}{2}}$	.82	1.00
K_1	1.23	.94	K_1	.79	.87

TABLE 6

Trace elements in Hevea leaf tissue

		Fe ppm	Mn ppm	Cu ppm	Zn* ppm	Mo 10^{-1} ppm	B ppm
Padukka	N_0	74	141	8.7	3.7	4.9	30
	N_1	85	219	12.8	3.1	2.8	37
	N_2	88	231	13.6	4.4	1.4	40
	$P_{\frac{1}{2}}$	83	172	11.5	3.4	4.3	35
	P_1	79	212	11.2	3.9	2.1	34
	P_2	84	208	12.3	4.0	2.5	37
	K_0	81	184	11.7	3.8	3.2	40
	$K_{\frac{1}{2}}$	84	198	11.9	3.8	2.5	35
	K_1	81	210	11.5	3.7	3.5	32
Nakia-deniya	N_0	114	47	10.7	3.9	4.9	74
	N_1	114	64	10.5	4.1	6.1	48
	N_2	109	72	12.3	4.1	5.0	101
	$P_{\frac{1}{2}}$	110	68	11.8	4.0	6.5	72
	P_1	109	52	10.2	4.0	5.5	74
	P_2	119	63	11.4	4.1	4.1	78
	K_0	114	62	11.3	4.0	6.0	70
	$K_{\frac{1}{2}}$	109	66	11.2	4.1	5.5	74
	K_2	114	55	11.0	4.0	4.8	79

TABLE 7

Potassium, Phosphorus and Nitrogen in soils as percentages air dry soil

	Potassium		*Phosphorus*		*Nitrogen*
	Citric acid Extract	HCl Extract	Citric acid Extract	HCl Extract	
Perth ...	.0089	.016	.0079	.017	.091
Pimbura ...	.0111	.102	.0009	.015	.192
Padukka ...	.0076	.054	.0006	.011	.130
Epping Forest ...	.0060	.019	.0002	.011	.157
Kepitigalla ...	.0068	.124	.0005	.020	.108
Nakiadeniya ...	.0074	.108	.0005	.005	.091

*NOTE.—Table 6 Zinc. These figures may be too low judging by more recent work here and at the R.R.I. Malaya.

Neither set of values for phosphorus appear to reflect the known fertility trends of these soils and it does not appear that this method is satisfactory for phosphorus.

The total soil nitrogen values appear to agree to some extent with known fertility trends, Epping Forest being high and Kepitigalla low. The differential, however, is not as great as might be expected and it seems probable that another form of nitrogen may give more useful results.

Some mechanical analyses have been made on the same soils and are reported in Table 8.

A departure was made from the usual method in that analyses were done on soils with and without a hydrochloric acid pre-treatment. This was done because it was considered that much of the coarser particles consisted of iron or aluminium cemented aggregates. These aggregates are extremely stable and there is no reason to believe that under Ceylon conditions, they would break down as do clay clods under rain in the temperate zone.

Therefore hydrochloric acid by chemically attacking these aggregates may be expected to give misleading values for the clay content of the soil.

That this may be so is shown by the increases in apparent clay content: 2.6 per cent. to 16.4 on Pimbura, 1.8 per cent. to 19.0 on Nakiadeniya and 2.0 per cent. to 10.2 on Epping Forest, as the result of adding the acid treatment. It is obvious that this increase in clay was achieved by breakdown of the silt fraction.

The high percentage of sand in all these samples is most noticeable and leaves no doubt as to the degree of leaching to which these soils are subject.

Field Experiments:

The following manurial trials were under observation during the year:—

(1) 2 × 2 × 2 NPK Dartonfield for yield and girth.

(2) O, P, NP, PK, and NPK Latin Square, Hedigalla, for girth.

(3) 3 × 3 × 3 NPK at Nakiadeniya and Padukka for girth. Experiments started in 1954.

(4) 3 × 3 × 3 NPK at Mahawale and Palmgarden for girth. Experiment started in 1955.

(5) O, P, NP, PK, and NPK Latin Square at Kepitigalla for girth. Original Experiment.

(6) 3 manure × 4 level trials at Degalessa, Mirishena, Epping Forest and Ederapolla.

Taking these in order we have:

(1) Dartonfield 2 × 2 × 2 NPK.

In **Table 9** are the girth measurements. We see that compost has given the best girth closely followed by NPK and then by PK, P and NP. NK is appreciably below these and well above N, K, and O. The Phosphate effect of 3.6 inches (30.7 minus 27.1) is most marked and significant. The Nitrogen

TABLE 8

Mechanical Analysis of Soils as percentages Air dry Soil

Estate	Treatment	C.Sand	F.Sand	Silt	Clay	Moisture	Loss on acid treatment	Total
Padukka	+ HCl	62.4	14.3	4.2	13.5	2.4	1.1	97.9
	— HCl	62.7	14.0	5.7	14.2	2.4		99.0
Pimbura	+ HCl	47.4	22.8	5.4	16.4	3.1	1.4	96.5
	— HCl	45.6	24.1	23.7	2.6	3.1		99.1
Nakiadeniya	+ HCl	53.7	16.0	6.3	19.0	2.5	1.3	98.9
	— HCl	53.4	14.7	27.3	1.8	2.5		99.6
Perth	+ HCl	69.1	18.3	1.5	7.6	1.0	0.8	98.2
	— HCl	70.6	17.0	1.2	9.3	1.0		99.1
Kepitigalla	+ HCl	36.9	29.6	6.1	22.0	4.3	2.2	101.1
	— HCl	32.3	29.7	10.0	21.3	4.3		97.6
Epping Forest	+ HCl	54.8	24.0	3.9	10.2	1.8	2.4	97.2
	— HCl	54.0	24.3	16.2	2.0	1.8		98.3

TABLE 9

Girth measurements in inches Dartonfield 2 × 2 × 2 NPK Experiment

	Block	1	2	4	5	6	Average	
O	($N_0P_0K_0$)	26.9	25.6	29.9	25.6	23.9	26.4 ± .85	Compost = 32.4″
N	($N_1P_0K_0$)	24.9	25.6	29.0	28.0	29.0	27.3	,,
P	($N_0P_1K_0$)	29.8	31.8	31.7	32.2	27.6	30.6	,,
K	($N_0P_0K_1$)	23.2	25.2	30.7	27.6	22.3	25.8	,,
NP	($N_1P_1K_0$)	30.1	30.0	32.2	29.5	30.4	30.4	,,
NK	($N_1P_0K_1$)	27.4	25.8	30.2	28.4	32.4	28.8	,,
PK	($N_0P_1K_1$)	28.6	33.4	33.6	28.3	28.9	30.6	,,
NPK	($N_1P_1K_1$)	28.6	30.5	34.2	31.8	30.3	31.1	,,

$N_0 = 28.3'' \pm .4$ $P_0 = 27.1'' \pm .4$ $K_0 = 28.7'' \pm .4$

$N_1 = 29.4'' \pm .4$ $P_1 = 30.7'' \pm .4$ $K_1 = 29.1'' \pm .4$

TABLE 10

Yields in lbs. per acre from Dartonfield 2 × 2 × 2 NPK Experiment

	Block	1	2	4	5	6	Average	
O	($N_0P_0K_0$)	615	550	524	684	552	585 ± 41	Compost = 777 lbs. p.a.
N	($N_1P_0K_0$)	448	759	497	983	801	697	
P	($N_0P_1K_0$)	844	972	874	978	746	882	
K	($N_0P_0K_1$)	622	543	738	920	694	703	
NP	($N_1P_1K_0$)	882	714	705	959	797	811	
NK	($N_1P_0K_1$)	730	556	676	945	810	743	
PK	($N_0P_1K_1$)	751	716	648	931	757	761	
NPK	($N_1P_1K_1$)	817	772	704	1036	827	831	

$N_0 = 732 \pm 20$ $P_0 = 682 \pm 20$ $K_0 = 743 \pm 20$

$N_1 = 770 \pm 20$ $P_1 = 821 \pm 20$ $K_1 = 759 \pm 20$

effect of 1.1 inches (29.4 minus 28.3) is hardly significant and the Potash effect not significant. These results and values are a repeat of the last two years.

Table 10 sets out the yield figures for this experiment. As previously Phosphate alone has given the highest yield and only the phosphate effect is significant.

The general conclusions to be drawn from this experiment are, as before, that Phosphate is essential in the Dartonfield area both for yield and growth. The nitrogen makes a small but significant contribution to growth and, that the Potash effect though not significant is no longer adverse as it was some years ago.

(2) Hedigalla Manurial Trial. A Latin square of five manurial treatments O, P, NP, PK, NPK. Girth measurements in Table 11.

There is a significant Phosphate effect averaging 0.8 inches or 12 per cent. and a further effect of 0.9" (12 per cent.) for Nitrogen. There is no significant Potash effect. This area is cleared jungle not a replanting.

(3) Table 12 and 13 gives girth measurements for experiments on Padukka and Nakiadeniya. These are 18 months old from the start of the experiments. In these trials three levels each of Nitrogen, Phosphorus and Potash are applied. The levels are distinguished by subscripts 0, $\frac{1}{2}$, 1 and 2 which indicate the amount of the element applied in terms of that amount applied as the standard dose of R. 4: 6: 5. So that Nitrogen levels of Nil, Normal and Twice Normal, Phosphate of half Normal, Normal, and Twice Normal, and Potash of Nil, Half Normal and Normal are applied.

It should be noted that Nakiadeniya is virgin land and not replanting.

On Padukka a Nitrogen effect of 9 per cent. is apparent. No other effect is clear though N1 $\times$ P2 $\times$ $K\frac{1}{2}$ has the highest girth. On Nakiadeniya the Nitrogen effect is 13 per cent. and the potash effect 7 per cent. In this area N2 $\times$ K1 gave the highest girth.

(4) Table 14 shows the girth measurements for Mahawale and Palmgarden in terms of the main fertiliser effects only. These experiments are only 6 months old and no significant results have therefore appeared.

(5) Table 15 gives girth measurements for Kepitigalla. Obviously only Nitrogen has an effect here, equivalent to 23 per cent. better growth.

(6) Table 16 presents girth data for Degalessa, Epping Forest and Mirishena. On these estates 3 types of manure were used R 8: 6: 4, R 6: 6: 6 and R 4: 6: 8. Each of these were applied at 4 different levels (or quantities per tree). No effects are apparent either for manurial type or quantity. These experiments are only 6 months old.

In general all those experiments which have been established for a sufficient length of time, show a clear nitrogen effect. A smaller but definite Potash effect occurs on a minority. Phosphate effects are less but this is probably due to the heavy dose of Saphos in the planting hole which, in theory if 100 per cent. utilised, would support at least 3 years growth.

The remaining field investigations were concerned with weed-killing and trials were carried out at Pimbura and Perth estates between January and May.

TABLE 11

Girth Measurements in inches from Hedigalla Manurial Trial

Column	1		2		3		4		5	
Row 1	O	7.1	NP	9.5	PK	7.8	P	7.9	NPK	9.0
2	PK	6.5	NPK	8.1	P	7.1	NP	7.7	O	7.3
3	NP	8.6	PK	6.8	NPK	7.7	O	5.6	P	8.2
4	NPK	8.8	P	8.1	O	7.0	PK	7.7	NP	8.1
5	P	8.2	O	7.2	NP	8.9	NPK	8.7	PK	8.1

O	6.8 ± .21 inches
P	7.9
NP	8.6
PK	7.4
NPK	8.5

N_0	7.6 ± .15	K_0	8.3 ± .15
N_1	8.5 ± .15	K_1	8.0 ± .15

TABLE 12

Girth Measurements in inches on Padukka Group 1955

$N_0P_{\frac{1}{2}}K_0$	5.4	$N_1P_{\frac{1}{2}}K_0$	5.5	$N_2P_{\frac{1}{2}}K_0$	6.0
$N_0P_{\frac{1}{2}}K_{\frac{1}{2}}$	5.6	$N_1P_{\frac{1}{2}}K_{\frac{1}{2}}$	5.7	$N_2P_{\frac{1}{2}}K_{\frac{1}{2}}$	6.3
$N_0P_{\frac{1}{2}}K_1$	4.9	$N_1P_{\frac{1}{2}}K_1$	5.7	$N_2P_{\frac{1}{2}}K_1$	6.0
$N_0P_1K_0$	5.4	$N_1P_1K_0$	5.5	$N_2P_1K_0$	5.8
$N_0P_1K_{\frac{1}{2}}$	5.2	$N_1P_1K_{\frac{1}{2}}$	5.3	$N_2P_1K_{\frac{1}{2}}$	5.9
$N_0P_1K_1$	6.1	$N_1P_1K_1$	5.5	$N_2P_1K_1$	5.5
$N_0P_2K_0$	5.6	$N_1P_2K_0$	5.5	$N_2P_2K_0$	6.4
$N_0P_2K_{\frac{1}{2}}$	5.4	$N_1P_2K_{\frac{1}{2}}$	6.5	$N_2P_2K_{\frac{1}{2}}$	5.6
$N_0P_2K_1$	5.5	$N_1P_2K_1$	5.6	$N_2P_2K_1$	6.3

N_0	5.4	$P_{\frac{1}{2}}$	5.7	K_0	5.7
N_1	5.6	P_1	5.6	$K_{\frac{1}{2}}$	5.7
N_2	6.0	P_2	5.8	K_1	5.7

TABLE 13

Girth Measurements in inches Nakiadeniya Group 1954

$N_0P_{\frac{1}{2}}K_0$	5.2	$N_1P_{\frac{1}{2}}K_0$	4.8	$N_2P_{\frac{1}{2}}K_0$	6.0
$N_0P_{\frac{1}{2}}K_{\frac{1}{2}}$	5.1	$N_1P_{\frac{1}{2}}K_{\frac{1}{2}}$	6.3	$N_2P_{\frac{1}{2}}K_{\frac{1}{2}}$	5.8
$N_0P_{\frac{1}{2}}K_1$	5.6	$N_1P_{\frac{1}{2}}K_1$	5.1	$N_2P_{\frac{1}{2}}K_1$	6.3
$N_0P_1K_0$	5.3	$N_1P_1K_0$	5.7	$N_2P_1K_0$	5.9
$N_0P_1K_{\frac{1}{2}}$	5.2	$N_1P_1K_{\frac{1}{2}}$	5.0	$N_2P_1K_{\frac{1}{2}}$	5.9
$N_0P_1K_1$	4.7	$N_1P_1K_1$	6.5	$N_2P_1K_1$	6.7
$N_0P_2K_0$	5.9	$N_1P_2K_0$	5.6	$N_2P_2K_0$	5.1
$N_0P_2K_{\frac{1}{2}}$	5.1	$N_1P_2K_{\frac{1}{2}}$	6.0	$N_2P_2K_{\frac{1}{2}}$	5.9
$N_0P_2K_1$	5.9	$N_1P_2K_1$	5.8	$N_2P_2K_1$	6.3

N_0	5.3	$P_{\frac{1}{2}}$	5.6	K_0	5.5
N_1	5.6	P_1	5.7	$K_{\frac{1}{2}}$	5.6
N_2	6.0	P_2	5.7	K_1	5.9

TABLE 14

Girth Measurements in inches on 3 × 3 × 3 NPK Manurial Trials

	Mahawale	*Palmgarden*
N_0	5.00	6.68
N_1	4.98	6.85
N_2	5.14	6.95
$P_{\frac{1}{2}}$	5.02	6.86
P_1	5.03	6.69
P_2	5.08	6.93
K_0	5.09	6.89
$K_{\frac{1}{2}}$	4.98	6.71
K_1	5.04	6.88

TABLE 15

Girth Measurements in inches Kepitigalla Group

NPK	8.18	NP	8.07	O	5.78	P	5.90	PK	7.04
NP	10.61	PK	8.08	NPK	10.07	O	10.37	P	10.06
P	11.91	O	11.06	PK	12.09	NP	14.08	NPK	14.74
PK	11.94	P	10.68	NP	14.05	NPK	14.28	O	10.96
O	11.20	NPK	13.39	P	10.03	PK	10.07	NP	13.20

O	9.9″
P	9.7″
PK	9.8″
NP	12.0″
NPK	12.1″

$N_0 = 9.75''$
$N_1 = 12.05''$

TABLE 16

Girth Measurements in inches on Manurial Mixture/ Quantity Trials

		Degalessa	Epping Forest	Mirishena
R 8: 6: 4	...	3.5	2.4	7.3
R 6: 6: 6	...	3.3	2.4	7.3
R 4: 6: 8	...	3.4	2.4	7.3
Top Level	...	3.4	2.5	7.4
2nd Level	...	3.4	2.4	7.2
3rd Level	...	3.5	2.4	7.3
Lowest Level	...	3.3	2.4	7.3

The preparations used were Amizole (3 amino 1.2.4.—Triazole), RD 4196 (2.4.D. and Penta chlorphenol), and three proprietary brands of Pentachlorphenol.

Amizole applied either at 4 lbs. or 2 lbs. per acre in 40 gallons water gave very effective results. Little effect was seen for 1-3 months after which the herbage turned white and died out with little or no re-establishment under 5 months from the spraying date. RD 4196 (at 4 gallons or 2 gallons per acre in 40 gallons of water was nearly as good though re-establishment may have been quicker. One of the proprietary Penta Chlor Phenol products was also moderately successful.

The Agency concerned have requested the larger scale use of this latter product and further trials with it and probably Amizol and RD 4196 on the larger scale are scheduled. It seems therefore that grass eradication before replanting is definitely possible at an economic price by chemical methods.

No other field investigations were undertaken during the year.

Other Work:

A survey of girth and weight measurements was completed in the first quarter and embodied in the paper "Growth and Girth Measurements in Hevea" which has been previously mentioned.

This has also been rewritten in a form of practical use to the Planter and will be published in due course.

By means of an estate questionnaire, part of the course of the main quartz belt was plotted. An advisory leaflet was issued to Agency Houses making specific recommendations on the manuring to be employed on the quartzitic area. Little deficiency work was done as symptoms do not generally start appearing till mid year. We have been informed by Opata Group, that on the $12\frac{1}{2}$ acres of 1940 PB. 86 which has been under special Potash treatment, yields have risen from 800-900 lbs. prior to 1953, to 1527 in 1954 and 1721 lbs. per acre in 1955.

Also by means of a questionnaire PB. 86 yields were studied and the results published in the Quarterly Circular. The most striking fact arising from this study was the high percentage of unsuccessful plantings in the Ratnapura District.

Advisory work continued heavy and the correspondence figures for 5 months are given below:

Correspondence:

Inward	...	...	... 357
Outward	...	...	... 276

(Both to 31st May).

REPORT OF THE ESTATE DEPARTMENT FOR THE YEAR 1955

By

L. Wijeyegunawardena

SUMMARY

Dartonfield Group.—The Institute's properties comprising Dartonfield, Nivitigalakele and Hedigalla Divisions were resurveyed. The revised total cultivated acreage of the Group now stands at 946¼ acres of which 288¾ acres were tapped during the year. 'Ladder' tapping at a 100 per cent. intensity on virgin bark was introduced on a 35 acre mature budded rubber block resulting in improved yields in the first year.

The crop harvested for the year amounted to 181,792 lb. representing a yield of 630 lb. per acre. Approximately 75 per cent. of the crop was manufactured in the form of crepe and 18 per cent. as creamed latex.

The Immature rubber areas in the Group totalled 643¼ acres of which 78 acres were planted at Hedigalla Division in the South West Monsoon of 1955, in accordance with the experimental requirements of the Botany Department.

Budwood of the RLD. series of clones was very much in demand throughout the year. The comparatively unimportant old clones were discarded from the multiplication nurseries to accommodate the more promising RLD. Clones.

The incidence of Oidium Heveae was light and control measures proved effective. Phytophthora leaf fall was confined to a 7½ acre budded block on Dartonfield. The Group as a whole escaped heavy infection. Of the root diseases, Leptoporus lignosus caused some concern in the new plantings and young replanted areas in the Group and control measures were adopted.

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 Controller's Nurseries at Egaloya continued to be looked after throughout 1955. By the end of the year the acreage planted increased from 65 acres in 1954 to 83 acres in 1955. These nurseries are now in full production. The opening of a further 60 acre nursery at Hedigalla for the Rubber Replanting Board is in hand.

Estimates for 1956 for Dartonfield Group were prepared by the writer and these were accepted by the Rubber Research Board. Two estimates for 1956 one for Egaloya Nursery and the other for the Hedigalla Nursery were submitted to the Rubber Replanting Advisory Board and were accepted.

DETAILED REPORT

Visiting Agent.—The Institute's properties were visited by Mr. J. D. Farquharson on two occasions (first on 23rd and 24th March and second on

19th, 20th, and 21st July). Mr. C. A. C. Bowen visited the properties on 16th September 1955. Reports on these visits were submitted to the Rubber Research Board.

Superintendent.—Mr. G. W. D. Barnet relinquished his post of Estate Superintendent, R.R.I.C., on 29th January and the writer was appointed to act in his place and was confirmed in the appointment after selection.

Staff.—Besides the writer, the Estate Department consisted of the following:—

Estate Office.—Mr. T. S. J. Peiris (Head Clerk), Mr. A. C. Swaris (Accounts Clerk) Mr. E. T. Seneviratne (Correspondence Clerk), Mr. D. A. Jayasinghe (Check Roll Clerk) and H. David (Peon).

Rubber Factory.—Mr. O. de Alwis (Rubber Maker) and H. A. Sirisena (Factory Attendant).

Dartonfield Division.—Mr. L. P. de Mel (Senior Field Assistant) till 1-9-55 and Mr. J. Pitchamuttu (Senior Field Assistant) thereafter. Mr. D. R. Colonne (Field Assistant) Mr. M. Abeyasinghe (Field Assistant), H. A. Haramanis (Estate K.P.) G. D. Seemon (Field Attendant), N. L. D. Ruban (Field Attendant), R. S. Sahayanesan (Field Attendant), K. S. A. C. Peiris (Field Attendant) and D. M. Wickremasinghe (Field Attendant).

Nivitigalakele Division.—Mr. J. Pitchamuttu (Senior Field Assistant) till 1-9-55 and Mr. L. P. de Mel (Senior Field Assistant) thereafter. Mr. H. A. Mendis (Field Assistant) I. H. Stephen (Field Attendant), A. K. Issanis (Field Attendant), K. D. Thalis (Estate K.P.) and W. T. Silva (Field Attendant).

Hedigalla Division.—Mr. D. C. Kannangara (Senior Field Assistant), Mr. K. D. Julius (Field Assistant), Mr. H. B. H. de Silva (Field Assistant), D. D. H. de Alwis (Estate K.P.) K. D. Simon (Field Attendant) and D. S. Attygalle (Field Attendant) from 1-9-55.

Other Staff.—Mr. B. R. E. Mendis (Apothecary), Mr. T. C. Fernando (Senior Artisan), Mr. K. C. L. Fernando (Electrician), Mr. L. H. M. de Silva (Work-shop Foreman), 2 Assistant Engine Drivers, 3 Car and Lorry Drivers and two school masters (Mr. S. Nadarajah at Dartonfield and Mr. D. F. S. Wickremasinghe at Hedigalla) were also on duty during the year.

R.R.S.S. Nurseries, Egaloya.—Mr. H. M. Buultjens continued to be Officer-in-Charge of these nurseries which are being maintained for the Rubber Rehabilitation Subsidy Scheme. The following appointments were made in the course of the year.

Mr. B. S. Perera—Nursery Manager from 10-10-55.

Mr. S. Munasinghe—Assistant Nursery Manager from 1-10-55*.

Mr. P. M. Tissera—Temporary K.P. from 1-10-55.

*Mr. Munasinghe was first appointed as Temporary K.P. with effect from 1st April.

Mr. H. M. Buultjens was promoted as Chief Field Assistant, Dartonfield Group, with effect from 1st October, but continued to be at the Nursery till the end of the year.

ACREAGES STATEMENT—DARTONFIELD GROUP

Dartonfield Division:

Field No.		*Year of Planting*		*Acreage*
1	...	1934	...	7—2—16
2	...	1936	...	9—1—08
3	...	1938	...	19—0—37
4	...	1939	...	1—3—16
5	...	1941	...	5—3—18
6	...	1947	...	10—1—08
7	...	1950/51	...	25—2—30
8	...	1952	...	33—3—18
9	...	1952	...	0—1—13
10	...	1953	...	16—1—20
11	...	1954	...	7—3—09
Nurseries	...		...	0—3—32
Clone Museum	...		...	3—3—08
	Total rubber		...	142—3—33
	Cleared for replanting in 1956		...	4—2—20
	Buildings and Sites		...	23—0—37
	Roads		...	6—2—22
	Swampy area		...	0—3—05
	Streams and Reservations		...	0—0—29
		TOTAL	...	178—1—26

Nivitigalakele Division:

Field No.		*Year of Planting*		*Acreage*
1	...	1926	...	15—3—25
2	...	1927 9-3-14	...	15—2—31
		1946 5-3-17	...	
3	...	1928	...	15—3—28
4	...	1946	...	15—1—14
5	...	1935	...	30—2—28
6	...	1939	...	10—1—01
7	...	1940	...	9—2—39
8	...	1941	...	7—0—33
9	...	1942	...	4—1—20
10	...	1943	...	6—3—33
11	...	1944	...	4—1—00
12	...	1953	...	4—2—25
13	...	1953	...	5—1—00
14	...	1954	...	10—0—30
Budwood Nurseries	...		...	5—1—17
Seedling Nurseries	...		...	7—3—27
	Total		...	169—2—31
	Buildings and Roads		...	2—0—15
	Deniya		...	0—2—08
	Jungle and Rock		...	1—3—38
		TOTAL	...	174—1—12

Hedigalla Division:

Field No.	*Year of Planting*	*Acreage*
1	1943	10—0—32
2	1944	11—3—14
3	1945 22-1-19	
	1953 6-1-15	28—2—34
4	1946	12—2—38
5	1947 45-0-15	
	1953 2-1-04	47—1—19
6	1949 34-2-38	
	1953 3-3-24	38—2—22
7	1950/51 19-3-16	
	1952 6-3-20	26—2—36
8	1952	72—2—00
9	1953	129—1—26
10	1954	177—2—06
11	1955	78—0—00
Total		633—2—27
Stream Reservations		13—0—29
Buildings and Sites		8—0—34
Pinewood Plantation		1—0—34
Roads		9—0—04
Rock and Scrub		0—2—20
Jungle		472—2—04
	TOTAL	1,138—1—32

ACREAGE SUMMARY—DARTONFIELD GROUP

Rubber	*Dartonfield*	*Nivitigalakele*	*Hedigalla*	*Total*
Mature	54–0–23	132–1–19	102–0–38	288–3–00
Immature	87–3–18	24–0–08	531–1–29	643–1–15
Nurseries	0–3–32	13–1–04	—	14–0–36
Total rubber	142–3–33	169–2–31	633–2–27	946–1–11
Building and Sites	23–0–37	1–0–28	8–0–34	32–2–19
Land cleared for replanting	4–2–20	—	—	4–2–20
Pinewood Plantation	—	—	1–0–34	1–0–34
Roads	6–2–22	0–3–27	9–0–04	16–2–13
Swampy Areas	0–3–05	0–2–08	0–2–20	1–3–33
Streams and Reservations	0–0–29	—	13–0–29	13–1–18
Jungle, Etc.	—	1–3–38	472–2–04	474–2–02
Total	178–1–26	174–1–12	1,138–1–32	1,491–0–30

Weather.—Rainfall (Estate Gauge) for the year amounting to 189.43 inches spread over 210 days in the year was well over the quinquennial average of 162.56 inches. An unprecedented fall of 13.96 inches was recorded in the month of February, and the wettest month for the year was May with a fall of 32.23 inches.

Rainfall.—Rainfall figures for 1951-1955 are shown below:—

Month	1951 *ins.*	1952 *ins.*	1953 *ins.*	1954 *ins.*	1955 *ins.*	*Quinquennial average* 1951—1955
January ...	13.21	5.03	3.75	11.66	7.63	8.26
February ...	2.12	8.40	5.12	9.62	13.96	7.84
March ...	11.61	6.63	15.21	17.46	13.66	12.91
April ...	14.60	11.69	10.10	17.13	11.75	13.05
May ...	23.40	18.00	4.96	30.10	32.23	21.74
June ...	23.20	13.69	6.79	6.47	23.09	14.65
July ...	23.54	2.50	34.69	8.55	13.89	16.64
August ...	1.76	6.92	6.67	9.78	2.87	5.60
September ...	18.57	8.70	8.87	10.54	20.78	13.49
October ...	11.98	19.08	24.28	28.66	21.20	21.04
November ...	17.80	12.30	15.17	10.76	22.11	15.63
December ...	5.03	16.01	11.93	19.32	6.26	11.71
	166.82	128.95	147.54	180.05	189.43	162.56

Total No. of Wet days 1955—210
,, ,, ,, ,, ,, 1954—211
May wettest month 32.23

Rubber Crop:

	1955	1954
Estimate ...	*171,150 lb.	152,200 lb.
Harvested ...	181,792 ,,	165,914 ,,
Excess ...	* 10,642 ,,	13,714 ,,

*This includes 6,950 lb. estimated against 1949 clearing (Hedigalla Division) which was not brought into tapping this year. The actual excess is therefore 17,592 lb.

Comparative Yield Records of individual fields

	Acreage in tapping	*Total yield in lb.* 1955	1954	*Yield per acre* 1955	1954
Dartonfield:					
1934 Replanted area	7½	6,112	7,511	814.9	1001.4
1936 ,, ,,	9½	7,274	7,097	765.7	747.0
1938 ,, ,,	19½	14,769	14,983	757.4	768.3
1939 ,, ,,	2	1,431	1,631	715.5	815.5
1941 ,, ,,	6½	4,590	5,129	706.2	789.0
1947 ,, ,,	10¼	7,635	5,695	744.9	555.6
	55¼	41,811	42,046	756.8	761.0
Nivitigalakele:					
1926 ,, ,,	13	10,167	7,247	782.1	557.4
1927 ,, ,,	10	8,128	5,796	812.8	579.6
1928 ,, ,,	15¾	11,326	9,142	719.1	580.4
1935 ,, ,,	28½	17,969	19,702	630.5	691.3
1939 ,, ,,	10¼	9,000	10,379	878.1	1012.6
1940 ,, ,,	9¾	7,784	9,755	798.4	1000.4
1940 Swamp area	3¼	2,869	2,442	882.8	751.3
1941 Clearing	7	7,781	8,574	1111.6	1224.9
1942 ,,	5	4,229	4,416	845.8	883.2
1943 ,,	3	1,873	1,555	624.3	518.3
1944 ,,	4½	3,517	3,882	781.6	862.6
1946 Replanted area	21	15,253	13,809	726.3	657.6
	131	99,896	96,699	762.6	738.2

Hedigalla:	Acreage in tapping	Total yield in lb. 1955	1954	Yield per acre 1955	1954
1943 Clearing	10¼	8,099	8,164	790.2	796.5
1944 ,,	11¾	7,716	8,492	656.7	722.7
1945 ,,	22¼	8,118	3,911	364.9	175.7
1946 ,,	12¾	6,393	3,630	501.4	284.7
1947 ,,	45*	9,759	2,972	216.9	74.3
	102	40,085	27,169	393.0	280.0
*Only 40 acres have been tapped in 1954					
Total for the Group	288¼	181,792	165,914	630.7	585.0
T.T. Biscuits from outside estates		3,625	267	—	—
	288¼	185,417	166,181	—	—

Tapping.—(*a*) Tapping was stopped on 16th February for resting during refoliation and resumed on 16th March. 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 drop in yield per acre in Field No. 1 Dartonfield could be attributed to the heavy attack of Phytophthora palmivora during the latter part of the South West Monsoon.

(*c*) The system of tapping in 35-acre block at Nivitigalakele Division (clearings 1926, 27 and 28) was changed over to ladder tapping on v/2 d/2 100 per cent. intensity on tapping tasks of 100 trees. Markedly high yields were obtained from this area as could be observed from the yield records shown above.

Analysis of tapping rounds for 1955 (1954 figures in brackets)

	Early tapping	Late tapping	Resting	No tapping Rain	Holidays
1st Quarter	44 (46)	15 (12)	28 (30)	2 (2)	2 (2)
2nd ,,	46 (42)	20 (18)	—	26 (24)	2 (2)
3rd ,,	58 (67)	18 (17)	—	9 (8)	—
4th ,,	60 (68)	16 (14)	—	14 (10)	3 (3)
	208 (223)	69 (61)	28 (30)	51 (44)	7 (7)

Manufacture:

A summary of the grades of the various forms of manufacture during the year is given below:

Latex Grades	Total in lb.	Percentage
Smoked Sheets No. 1	140	.08
,, ,, No. 2	106	.06
Pale Crepe No. 1	75,295	40.61
,, ,, No. 2	17,958	9.69
,, ,, No. 3	13,726	7.40
Sole Crepe No. 1	6,039	3.26
,, ,, No. 2	801	.43
Creamed Latex	32,583	17.57
Ammoniated Latex	246	.13
Latex for Experiments	3,323	1.79
	150,217	81.02

Scrap Grades			
Scrap Crepe	No. 1	27,506	14.83
,, ,,	No. 2	7,246	3.91
,, ,,	No. 3	448	.24
		35,200	18.98*
	Grand Total	185,417	100.00

*The percentage of Scrap grades is necessarily high due to the test tapping biscuits obtained in connection with experimental recording of yields of individual trees.

Pests and Diseases:

Oidium Heveae.—Weather conditions considerably inhibited the activity of Oidium. The incidence of this disease was light. Sulphur dusting operations were carried out successfully, resulting in healthy foliage.

Phytophthora palmivora.—Despite the heavy foliage and the excessive monsoon rains, the incidence of this disease was confined to 7½-acre block at Dartonfield which was adversely affected, causing a very heavy leaf fall, accompanied by premature fruit fall. The results of this attack were reflected in the yield from this area.

Bark Rot.—Applications of Cargillineum and the water miscible phenolic disinfectant Brunolinum Plantarium were made on tapping cuts in dry and wet weather respectively. There was no Bark rot of note during the year.

Leptoporus Lignosus.—A few scattered cases of this disease were found on the mature areas and routine control measures were adopted.

Ustulina Deusta.—A negligible number of trees was attacked by this disease.

Brown Bast.—Trees affected by this were treated and rested. The incurable trees were slaughter-tapped and then uprooted.

Canker.—Canker scraping was carried out on the three Divisions where necessary.

Corticium Salmonicolor.—No cases in the areas in tapping.

Wind Damage.—There was no serious wind damage this year. Instances of branch and main stem damage were few and these were attended to by lopping at appropriate heights.

Details of losses of trees due to various causes were given in the monthly reports of this Department.

Estate Roads and Paths.—General upkeep and improvements were carried out throughout the year.

Manuring.—All mature areas were manured in keeping with the Institute's recommendations.

Weeding.—Mature rubber areas in tapping were weeded in alternate months maintaining them clean and tidy.

Covers.—A reasonably good cover crop of Desmodium ovalifolium and Pueraria was maintained in all the areas.

Capital Account—Agricultural Development

Dartonfield Division—Immature Replanted Areas—

1950/51 Replanted Area	— $26\frac{3}{4}$	acres
1952 Replanted Area	— 35	,,
1953 —do—	— 14	,,
1954 —do—	— $4\frac{3}{4}$	,,

Weeding.—The replanted areas were weeded monthly and are clean and tidy.

Pests and Diseases.—Leptoporus lignosus was mainly responsible for the loss of trees in these areas. Routine measures of control were adopted.

Manuring.—These replanted areas received R.4:6:5 fertilizer in accordance with the manuring programme drawn up for the group.

Fences and Boundaries.—These were attended to where necessary.

1952 Replanted Area—35 acres—Crown Budding.—This field which carries 50 per cent. of the area with top buddings received careful attention. Where both grafts on a tree had been successful, and the crown had developed to over 3 feet in height, the weaker growing shoot was sawn off leaving about $\frac{1}{2}$ inch from the point sawn, to the centre budded section.

Nivitigalakele Division:

1953 Clearing—$9\frac{3}{4}$ acres—"Sorana" Seedlings.—In this clearing 1,980 seedlings were originally planted, spaced at 35′ × 5′. This block was divided into two sections:—In one section the seedlings were budded with RLD.44 and in the other with RLD.45. In order to reduce the stand per acre from the existing seedling stand to 180 (approx.) for budded rubber, bud groups of two or three trees according to stock seedling size were selected and budded, resulting in 15 seedlings being budded out of every 20 along the contour. The stocks of all successful buddings were cut back. In November, supplies were effected totalling 21 of RLD.41 and 15 of RLD.45.

Routine weeding, cultivations and other agricultural operations were carried out.

1954 Clearing—10 acres.—This area has been planted at a spacing of 20′ × 10′ and consists of budded material of each of the following clones laid out in five randomised blocks of 40 each.

IR. 7, IR. 10, PB. 6/5, PB. 28/29, PBT. 207, PB. 24/51, PB. 24/3, and RRIM. 501 (control).

Routine weeding, manuring and other agricultural operations were met.

Hedigalla Division:

1949 Clearing—$34\frac{3}{4}$ acres.—It was envisaged that this area would be brought into tapping in 1955, and the estimated crop for the season was accordingly computed. Girth measurements taken in December 1954 when the

plantation was 5½ years old showed that only 6 clones out of 31 had reached tappable girth. The layout of this trial precluded the possibility of making a practical tapping task as the tappable clones were scattered over the 34¾ acres in 25 tree plots. It is interesting to note that of the 31 clones planted, the following six reached tappable girth early.

RLD. 52, RR. 33, PB. 6/50, NAB. 20 and 17, RR. 46.

1947 Twin Seedling Area—Crown Budded with Clones Tjir 1 and LCB. 870 in 1949.—This clearing was brought into tapping after the wintering period in 1955.

Immature Areas.—1950/51 Clearing — 20 acres
1952 ,, — 79¼ ,,
1953 ,, — 142 ,,
1954 ,, — 177½ ,,

(*a*) Routine weeding, cultivation and other agricultural operations were carried out in these clearings.

(*b*) **Pests and Diseases**—In the above clearings Leptoporus lignosus took its toll, mainly from the 1953 clearing—56 cases have been recorded to date. This item of expenditure was heavily overspent in an effort to check the spread of this disease. The table below gives a census of the distribution of diseases throughout the Group for the year ending 1955.

Trees Uprooted:

Hedigalla	*Mature Areas*	1949 *Clg.*	1950 *Clg.*	1951 *Clg.*	1952 *Clg.*	1953 *Clg.*	1954 *Clg.*
Leptoporus Lignosus		8	9		11	56	29
Brown Bast	3	—	2		2	11	—
Dead Trees	1	1	6	—	—	—	—
Wind Damaged	17					4	
	21	9	17		13	71	29
Dartonfield							
Ustulina Zonata	6	—	8	—	2	3	—
Leptoporus Lignosus	1		5	—	44	8	3
Fomes Lamaensis	1	—	—	—	—	1	—
Dead Trees	—	—	11	—	—	—	—
Wind Damaged	—	—	2	—	—	—	—
	8	—	26	—	46	12	3
Nivitigalakele							
Ustulina Zonata	18						
Wind Damaged	58						
Brown Bast	12						
Diplodia	3						
Leptoporus Lignosus	6						5
Bleeding Canker	2						
	99						5

1955 Clearing—78 acres.—This area was felled, burnt and cleared by the end of April for the layout of a large scale clone trial consisting of 12 varieties in blocks of 3 replications of 250 tree plots. The distance of planting rows being 8′ × 30′ gives a stand of 180 per acre. Planting holes were cut—$1\frac{1}{2}$′ × $1\frac{1}{2}$′ × $1\frac{1}{2}$′ to accommodate the lateral root system, with a centre hole of an additional foot made with an alavango to take the tap root.

A good mixed cover of Desmodium ovalifolium and Pueraria Javanica was established. Useful inspection paths were cut.

Planting and Material.—Planting commenced in early June. 9,835 budded stumps were transported from Nivitigalakele and Dartonfield nurseries for planting, and protecting baskets purchased locally were used. In addition 960 H.P. seedlings of 1953 series together with 1204 derived clones were planted out. The clones under test being RLD. 9, 11, 12, 13, 14, 40, 41, 43, 46, 47, 49, and 50.

Additional plants to serve as supplies were planted in trenches in the field.

Manuring.—The plants were manured at 8 ozs. per plant using Black label Animal Meal at the time of planting. Three months later, four monthly applications of R 4:6:5 at 4 ozs. per plant were made.

NURSERIES

Upkeep and Establishment of Seedling and Budwood Nurseries—Dartonfield Group:

H.P. Seedling Nursery—Dartonfield $\frac{1}{2}$ Acre.—78 Hand Pollinated seeds of the 1955 series were put out for germination and later planted out in this nursery.

Preparation of Beds.—The 1-acre nursery at Nivitigalakele Division was cleared of all old seedlings and prepared to receive germinated seed and was planted up with 29,000 mixed clonal seedlings. A further 20,450 seedlings were planted in the vacant beds of the 5-acre and smaller nursery area at Nivitigalakele.

Manuring.—The nursery plants were manured regularly in accordance with the Institute's recommendations.

Weeding.—Routine operations of weeding and clearing of drains were carried out.

Budding and Attention.—Budded stumps were prepared for the new planting requirements of the Group. In addition 3,500 buddings of PB. 86 were made and sold to clear the nurseries of mature stocks.

Budwood Nurseries—Nivitigalakele:

Dothidella ulei—resistance Clones of Malaya.—15 points each of the following 17 clones were established in the budwood nurseries.

FX. 2784, 636, 664, 360, 652, 25, 1619, 232, 351, 714, 4037, 409, 1638, 4506, 4537 and FB. 3363, 3300.

RLD. Clones.—The following clones were established as extra sources of budwood. RLD. 9, 28, 31, 41, 42 and 45.

RLD. Clones from H.P. Material planted on outside estates.—The following clones were established:—

RLD. 69 and 70	from	Culloden
RLD. 72 and 73	,,	Vogan
RLD. 67	,,	Eduragalla
RLD. 68	,,	Dalkeith
RLD. 71	,,	Mirishena.

Budwood distribution.—Budwood of various clones was sold to estates and small holdings and budwood was also obtained from these nurseries for the Institute's requirements.

FOOD PRODUCTION

Pineapples harvested from Hedigalla Division were sold to members of the staff and estate labourers during the year.

FIELD AND FACTORY EXPERIMENTS

The Agronomy, Botany, Chemistry and Pathology departments were given assistance in carying out their field and factory experiments.

SUSPENSE ACCOUNT

1956 and 57 Planting:—140 Acres Hedigalla Division.—Felling, Burning and Clearing of 71 acres for the 1956 planting is in progress. Approximately 60 acres were felled by the end of the year.

LABOUR AND HEALTH

Labour.—A surplus of labour necessitated a drastic cutting down of hands. 54 villagers were discontinued on the Group and a few families of resident Sinhalese labour were transferred to Hedigalla Division. The present labour position in the Group is very much more balanced and settled. Wages were paid during the year in accordance with the Wages Boards Ordinance in force.

DARTONFIELD GROUP

Working Ceylonese	*Resident*	*Non-resident*	*Total*
Men	95	122	217
Women	76	79	155
Children	8		8
Working Immigrants			
Men	39	—	39
Women	26	—	26
Children	—	—	—
Grand Total	244	201	445

Annual Holidays.—Annual holidays with pay were given to all labourers who were entitled to these in accordance with the ordinance.

Maternity Benefits.—7 ordinary and 9 alternative maternity payments were made.

Feeding Children.—Free rations and ¼lb. of bread were issued to each non working child.

Health.—The health of the members of the Institute's staff and of the estate labourers was satisfactory during the year.

Infectious and Contagious Diseases.—Three cases of measles were detected on the Group during the year—(Two at Dartonfield and one at Nivitigalakele).

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.

Milk Foods.—Milk foods were issued to all infants whose mothers were incapable of nursing them.

Births.—Seven children were born during the year on the Group.

Deaths.—There were no deaths on the Group this year.

Mass Anky Treatment.—Mass anchylostomiasis treatment was carried out at Dartonfield and Hedigalla during the year by the Staff of the Health Department. This was in addition to those cases treated by the Institute's Apothecary.

Vaccination.—Primary vaccination of children was carried out by the Health Department Vaccinator at Dartonfield and at Hedigalla during the year.

B.C.G. Inoculations.—Officers of the B.C.G. Campaign carried out B.C.G. inoculations successfully this year at Dartonfield and at Hedigalla.

A list of diseases treated by the Institute's Apothecary is given below:

Influenza ...	...	...	464
Malaria ...	...	...	Nil
Ulcers ...	...	...	162
Anchylostomiasis	...	...	66
Measles ...	...	...	3
Other intestinal parasites	...	...	153
Chicken pox ...	...	...	Nil
Dysentry ...	...	...	Nil
Other diseases ...	...	...	1,714
	Total	...	2,562

MAINTENANCE OF BUILDINGS, ETC. (REVENUE ACCOUNT)

General Buildings.—The Offices and Laboratories were colour washed and minor repairs where necessary were effected.

Bungalows.—All Senior, Intermediate and Assistant Staff bungalows were maintained in good order during the year.

Water and Power Supply.—A very satisfactory standard was maintained.

Bungalow Furniture.—The unserviceable articles rejected by the Institute's Board of Survey were replaced during the year and repairs too were effected where necessary.

Motor Vehicles.—The Station Wagon, Commer Lorry, Jeep and Dodge Truck were maintained in good running order throughout the year.

Machinery.—Messrs. H. W. Hammond & Co. Consulting Engineers visited the Institute on 14th and 15th March 1955, and inspected all machinery and power plants. Their report on this inspection was submitted to the Rubber Research Board. The Visiting Engineers' recommendations were implemented.

Power Plant.—The Institute's Power Plant is comprised of the following:

Dartonfield Division.—(*a*) 80/90 B.H.P. National Engine with a V belt driven 55 K.W. 230 Volts Compound Wound Generator.

(*b*) 240 B.H.P. Blackstone Four Cylinder Vertical Diesel Oil Engine direct coupled to a D.C. 180 K.W. 230 Volts Compound Wound Generator.

(*c*) 40 B.H.P. Lister Four Cylinder Vertical Diesel Oil Engine direct coupled to a 24 K.W. 230 Volts Compound Wound Generator.

Nivitigalakele Division.—5 B.H.P. Vertical Four Stroke National Oil Engine with a V belt driven $2\frac{1}{2}$ K.W. 230 Volts D.C. Generator.

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 5 B.H.P. National Engine at Nivitigalakele was fitted with a new Piston and liner and was completely overhauled.

Fuel Consumption:

	Average per hour
80/90 *B.H.P. National Engine*	
Liquid Fuel	2.25 gallons
Lubricating oil	0.23 ,,
40 *B.H.P. Lister Engine*	
Auto Diesel	1.36 gallons
Lubricating oil	0.12 ,,
240 *B.H.P. Blackstone Engine*	
Liquid Fuel	3.25 gallons
Lubricating oil	0.50 ,,
20 *B.H.P. Gardener Engine (Hedigalla)*	
Liquid Fuel	0.75 gallons
Lubricating oil	0.06 ,,
5 *B.H.P. National Engine (Nivitigalakele)*	
Liquid Fuel	0.75 gallons
Lubricating oil	0.08 ,,

Factory Machinery.—There were no additions to the factory machinery. Belt and Gear guards were fitted to all machinery in accordance with the recommendations of the Visiting Engineer. A 26″ × 14″ Smooth Mill which required the skimming and facing of rolls and replacement of bearings was attended to by Messrs. Brown & Co. All machinery were maintained in good working order.

6 N.H.P. Vertical Cross Tube Cradley Boiler.—This boiler worked satisfactorily throughout the year.

Smoke House:

Direct fired Air Heater.—This plant installed by Colombo Commercial Co. Ltd. together with an Alcosa Blower and a 4 B.H.P. electric motor worked satisfactorily.

Battery House.—The Akaline 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 Myers pump driven by 5 B.H.P. motor were maintained in good order.

(*b*) The 4″ × 3″ double acting Horizontal Lee Howel Pump driven by a 5 B.H.P. motor functioned satisfactorily.

(*c*) The Walker & Greig pump driven by a 2 B.H.P. motor which was completely overhauled in the previous year worked very satisfactorily.

Machinery in 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)

Asst. Staff Bungalows.—Two bungalows one at Dartonfield and the other at Hedigalla Division were built. These are of a plan different from the standardised R.R.I.C. Asst. Staff Bungalow type. As the walls were made of 4″ cement bricks, corrugated Aluminium sheets were used for the roof. The bungalows were completed in mid December.

Incinerators.—Five incinerators were constructed, one at Nivitigalakele Division and 4 at Dartonfield. These are functioning well.

Extension to Asst. Staff, Chummery—Dartonfield.—An annexe of two rooms and a verandah was built.

Petrol Shed.—(Dartonfield). This was completed during the year.

Double Unit Quarters for Labourers.—(Hedigalla). This work was held up due to heavy monsoonal rains and is being expedited and would be ready early in 1956.

Double Cottage for Minor Staff—Hedigalla.—As no reasonably good tender was received, this work was not taken in hand.

A Motor Garage.—(Hedigalla)—This was completed.

Water and Power Supply.—(*a*) One Double bathing well for Minor Staff (Males and Females) at Dartonfield was constructed.

(*b*) One well, overhead tank and a hand pump were provided for Hedigalla labourers quarters.

(*c*) The laying of an underground cable at Dartonfield in lieu of the overhead mains to the Asst. Staff Bungalows was completed.

(*d*) Lighting mains for Hedigalla Division is under construction.

Vehicles.—A new Land Rover was purchased for the use of the Staff.

Retaining Wall.—The heavy N. East rains caused a land slip in the Botanical Block and immediate action was taken to build a retaining wall in rubble and cement. This work is in progress.

In addition to the new works referred to above under capital, the following renovations were completed.

(1) *Asst. Staff Bungalow No.* 13.—The roof was almost completely redone.

(2) *Senior Staff Bungalow Nos.* 1 *and* 5.—Replacement of gutters and down pipes was effected.

(3) Water supply lines to Asst. Staff Bungalows and Laboratories were renewed.

New Roads—Hedigalla Division:

(*a*) The extension of the cart road, approximately half mile encircling the 1952 clearing was successfully completed in July.

(*b*) One mile of cart road was constructed leading to the 1955 clearing.

(*c*) A further extension of the cart road along the 1954 clearing approximately a quarter mile is nearing completion.

RUBBER REHABILITATION
SUBSIDY SCHEME NURSERIES AT EGALOYA AND HEDIGALLA

The Egaloya Nurseries opened up by the Institute in May 1953 continued to be looked after throughout 1955.

Superintendence.—The Estate Superintendent, R.R.I.C., paid supervisory visits to the nurseries weekly.

Acreage Statement:

	A.	R.	P.
Seedling Rubber Nurseries	82	2	35
Budwood Nurseries	4	1	28
Coconut	1	0	07
Paddy	4	3	05
Roads	0	3	37
	93	3	32

The planting acreage of the nursery increased from 65 acres in 1954 to 83 acres in 1955. This brings to a close the envisaged acreage for planting at Egaloya. All the available ground has been utilised.

Rainfall.—A rainfall of 191.07 inches was recorded during the year.

Planting Material.—Two large scale budding programmes were completed for the South West and North East distribution of planting material in 1955, made up of 302,410 Buddings for the South West issues and 99,569 buddings for the North East issues. A total of 269,551 budded stumps was issued from the Egaloya nurseries for the year.

Tjir 1 Seedlings.—A total of 101,697 TJ. 1 seedlings was issued for the year. These were supplemented with 24,932 seedlings from the Rubber Research Institute of Ceylon Nivitigalakele Nursery.

Visits.—The Rubber Replanting Advisory Board visited these nurseries on 8th March 1955.

Establishment of a Nursery on Hedigalla Division.—In December this year, the Rubber Replanting Advisory Board decided that a 60-acre nursery be established at Hedigalla. An estimate for 1956 Capital and Revenue expenditure was prepared by the writer and submitted to the Rubber Rehabilitation Advisory Board which was approved. This work is now in progress.

GENERAL

Correspondence:

Inward	...	...	...	967
Outward	...	...	...	1,067

Estimates.—(*a*) Estimates for 1956 Capital and Revenue expenditure in Dartonfield Group were prepared and submitted by the writer to the Rubber Research Board.

(*b*) Two estimates for 1956 Capital and Revenue expenditure, in respect of the Rubber Rehabilitation Subsidy Scheme Nurseries at Egaloya and Hedigalla, prepared by the writer, were approved by the Rubber Replanting Advisory Board.

REPORT OF THE SMALLHOLDINGS DEPARTMENT FOR THE YEAR 1955

By

W. I. Pieris

SUMMARY

The Smallholdings Department Office was moved from the Fort to 33 Clifford Place, Colombo 4, as from 1st February 1955.

An Accounts Clerk, 5 extra Temporary Rubber Instructors and 2 Temporary Replanting Assistants were appointed in August. All 4 District Field Officers were transferred in December in a general re-shuffle of supervisory staff. One District Field Officer and 3 Rubber Instructors were given loans for purchasing motor vehicles.

A Trial Scheme for Sulphur-Dusting Smallholdings in the Kegalla District was carried out in January-March. 78 Holdings comprising 178 acres were dusted in the Warakapola, Kegalla and Nelundeniya areas with 3 dusting machines under 3 trained Rubber Instructors. Owners contributed Rs. 20/- or Rs. 30/- per acre towards the cost, according to size of holding. An average of 6 weekly dustings @ 12 lbs. sulphur per acre per dusting was given to each holding. Good weather prevailed throughout and marked beneficial results were obtained. Replies to a Questionnaire sent to all owners confirmed that Oidium infection and leaf-fall were considerably less on dusted as against neighbouring undusted areas. The over-all cost came to Rs. 48/78 per acre.

An enlarged scheme for sulphur-dusting in several districts with 16 machines supplied by Government was organised and started for 1956. Owners were required to form co-operative "groups" of their own and carry out dusting themselves, after necessary training. Machines and supervision were supplied free. A deposit of Rs. 15/- per acre was collected from each owner towards the actual cost of sulphur supplied (any balance to be refunded). 16 groups were formed in various districts and the first dusting was done at Undugoda on 24th December 1955, wintering being early. The first round on each holding was supervised by a Rubber Instructor throughout but owners did the work themselves thereafter, with part-time supervision from Instructors. A total of 1,633 acres in 308 holdings are being dusted. 44½ tons of sulphur was supplied. Costs of sulphur, labour and transport will be borne by members of a group on a co-operative basis.

The field staff had heavy work in advising and doing lining on Subsidy Replanting areas. They lined 2052 subsidy holdings (3,218 acres) for soil conservation and 2,435 holdings (3,689 acres) for holes. 20,168 advisory visits were paid to subsidy holdings and record-sheets maintained for every holding. Smallholders (under 10 acres) received 4,218 permits for 6,847 acres for 1955.

Instructors sent 4,387 reports to the Rubber Controller on the suitability of lands for new-planting. 697 holdings (945 acres) were lined for soil conservation. Rs. 13,553.54 was paid to 296 peasant-class permit-holders as soil conservation grants. 3,597 permits covering 5,696 acres were issued and 181

permits were cancelled. 16,174 visits to new-planting holdings were paid by Instructors. The Board decided to issue planting material to peasant-class new-planters in 1956. 1,340 budded stumps of PB. 86 were sold.

By sheet-making demonstrations and constructing smoke-houses the quality of sheet was improved. 434 demonstrations were given and 16 demonstration and 18 private smoke-houses were constructed. 500 sq. ft. of mesh for strainers and 116 aluminium latex pans were sold at concession rates. 254 samples of acid were tested. The market price of No. 1 sheet varied from Rs. 1/10 to Rs. 1/50.

Instructors paid 164 visits to Latex Centres. 4 centres were closed down owing to a number of owners replanting their lands.

182 tapping, 119 disease control and 375 miscellaneous demonstrations were given by Instructors in addition to the sheet demonstrations.

DETAILED REPORT

Office

The office of the Smallholdings Department was moved to 33 Clifford Place, Colombo 4, as from 1st February 1955, owing to lack of accommodation at the Rubber Controller's Office, Fort.

Staff

The staff, at the beginning of the year, consisted of one Smallholdings Propaganda Officer, three Assistant Propaganda Officers, four District Field Officers, twenty nine Rubber Instructors, six Temporary Rubber Instructors, four Clerks, one Temporary Clerk and two Peons. In August, five extra Temporary Rubber Instructors (Messrs. Q. B. Marambe, S. K. Navaratne, L. D. Thambugala, A. K. Jayatissa and C. Wickremanayake) and two Temporary Replanting Assistants (Messrs. O. M. W. Tillekeratne and H. A. Dharmadasa) were appointed to assist in the heavy lining and advisory work connected with the Subsidy Replanting Scheme.

Mr. A. B. Jayasundera, Accounts Clerk, left the Department in June and Mr. P. D. Edirisinghe, Temporary Rubber Instructor, left in May without giving notice. Mr. K. J. L. Perera commenced duties as Accounts Clerk in place of Mr. Jayasundera on August 8th.

All four District Field Officers were transferred at the end of the year as follows:—

Mr. D. E. A. Abeywickrema	from Kegalla	to Baddegama
Mr. D. R. Ranwala	from Baddegama	to Horana
Mr. P. S. G. Cooray	from Horana	to Ratnapura
Mr. B. D. Pedrick	from Ratnapura	to Kegalla.

Loans for the purchase of motor vehicles were given to the following officers:—

Mr. P. S. G. Cooray,	District Field Officer Horana	—	Rs. 8,200/-
Mr. W. D. Abeysena,	Rubber Instructor Eheliyagoda	—	,, 2,500/-
Mr. R. B. Heendeniya,	Rubber Instructor Kegalla	—	,, 1,400/-
Mr. D. J. Ratnayake,	Additional Rubber Instructor	—	,, 2,250/-

Sulphur Dusting 1955

The Trial Scheme for Sulphur-Dusting Smallholdings in the Kegalla District was satisfactorily organised and carried out from 18th January to the

end of March. Out of 130 holdings comprising 318 acres originally accepted for dusting, only 78 totalling 178 acres were eventually dusted, the remainder having failed to pay the charges due (Rs. 20/- per acre for lands of under 10 acres and Rs. 30/- for those of 10 to 50 acres). These 78 holdings were allocated to the three Rubber Instructors in the Warakapola, Kegalla and Nelundeniya ranges, each of whom was supplied with a dusting machine and motor van with which they visited and dusted all selected holdings in their ranges under their personal supervision. Dusting was started as soon as 10 per cent. of the trees in a holding had just begun to sprout (refoliate). Most holdings received six dustings at regular weekly intervals @ 12 lbs. of sulphur per acre per dusting, the least number of dustings given to any holding being five. The size of individual holdings dusted varied from $\frac{1}{4}$ acre to 16 acres and 75 of the 78 holdings dusted contained budded Rubber. Exceptionally good dusting weather was experienced, there being not a single interruption by rain. On the whole oidium infection was of normal intensity but not as severe as in the worst years. Thick early morning mists developed when the season was half advanced and this caused a marked increase in infection during the latter half. Ill-nourished, badly-tapped, old seedling plantations were more severely affected. Dusting was done daily from 6 to 9-30 a.m. on 5 days of the week, Saturdays being left free for making good any interruptions caused by rain or break-downs.

Marked beneficial results were obtained on all dusted holdings. A large proportion had hardly any leaf fall at all caused by oidium while those which wintered late and caught the more severe late infection suffered only slight damage as compared with undusted holdings.

74 replies were received to a Questionnaire sent to the 78 owners of dusted holdings. All 74 affirmed that oidium infection was considerably less on the dusted trees, of whom 20 said it was entirely absent and 40 others that 75 to 90 per cent. of their dusted holding was free of it.

The over-all costs worked out at Rs. 48/78 per acre for the entire treatment. This is rather high but it includes Rs. 11/41 on salaries and travelling of supervisory staff and Rs. 9/- on petrol for vans and drivers' salaries. It must also be appreciated that the dusting of widely-scattered small blocks of a few acres is bound to cost more than the dusting of a large estate owing to difficulties of transport and the wastage of time involved.

A detailed report on the dusting trial was issued.

Sulphur Dusting 1956

Following the successful results of the 1955 Dusting Trial, the Government decided to offer extended facilities to smallholders to dust their holdings in 1956 and requested the writer to formulate a suitable enlarged scheme to dust holdings in oidium-infected districts with 12 dusting machines to be supplied free. This was later increased to 16 machines.

Owing to the large staff that would be required if dusting was to be carried out by Departmental officers as was done in 1955, it was decided to organise the scheme for 1956 on slightly different lines. Small owners themselves, who wished to have their holdings dusted, were required to form themselves into co-operative "Groups" in different areas and apply, through their Group Organiser, for the loan of a machine on a prescribed form which would furnish all necessary particulars re situation, acreage, etc. of the holdings. When accepted, every member of a group had to make a deposit of Rs. 15/- per acre, which would be used mainly to defray the cost of sulphur. Dusting operations would be conducted, after necessary training, by the members of the groups themselves, under the supervision of Rubber Instructors.

16 dusting groups were formed by 15th December and full payment was collected, whereupon training in the use of the machine and in dusting was given by the Department al staff to representatives of each group. Dusting proper was arranged for each of the 16 machines on 6 days of the week from 6 to 9-30 A.M. each day. Wintering was earlier than expected in some areas and dusting operations commenced at Undugoda on December 24th, shortly followed by other groups. The first round of dusting on each holding was personally supervised throuhout by the field staff and sometimes the second as well. Thereafter dusting was carried out by the groups themselves while the Rubber Instructor of the area kept a general eye on the work and furnished weekly reports of the progress on each holding. Costs of transport, labour and other incidental expenses were borne by the group members co-operatively. The 16 groups formed were at Lellopitiya, Kuruwita, Aluthnuwara, Undugoda, Kosgama, Dompe, Uduwa, Padukka, Dodanpapitiya, Kitulgoda/Liniyawa, Pitigala, Talpe, Talgaswela, Kotapola, Ehelepe and Matugama.

The total acreage to be dusted is 1633, comprising 308 holdings and small estates. They vary in size from ½ an acre to 47¾ acres each. 12 Kestrel and 4 Mistral IIA dusting machines and 44½ tons of sulphur were purchased for the scheme and s.nt to the different groups. A leaflet explaining the scheme in detail was printed and issued to Rubber Smallholders through Rubber Instructors in early October.

Replanting

The field staff had heavy work throughout the year in lining the holdings of small owners who had obtained permits under the Subsidy Replanting Scheme and in giving general advice and directing field operations on such holdings.

The following replanting permits were issued by the Rubber Controller in respect of the year 1955:—

	Permits	*Acres*	*R.*	*P.*
Estates over 100 acres ...	397	11,890	0	24
Estates 10 to 100 acres ...	1,209	9,513	0	04
Smallholdings under 10 acres	4,218	6,847	0	20
	5,824	28,250	1	08

Similar permits issued in 1955 in respect of the year 1956 were:—

	Permits	*Acres*	*R.*	*P.*
Estates over 100 acres ...	356	9,747	0	29
Estates 10 to 100 acres ...	912	6,967	0	12
Smallholdings under 10 acres	3,767	6,314	0	06
	5,035	23,028	1	07

These figures indicate that a much larger quota of permits has been issued to smallholders for 1955 and 1956 than the 2,437 permits issued in respect of 3,989 acres for the year 1954, involving a proportionate increase in work.

By the end of July progress made in lining holdings by Rubber Instructors was not satisfactory, mainly due to the delay by owners to fell their trees.

A letter was, therefore, sent to owners warning them of the danger of their not being able to complete planting by the end of the year, in which event their permits would be cancelled. This resulted in a marked improvement in the situation.

Instructors lined 2,052 subsidy holdings (3,218 acres) for soil conservation and 2,435 holdings (3,689 acres) for holes during the year. 20,168 advisory visits were paid to holdings, each visit with the advice given being recorded in a record sheet maintained in respect of every holding. The services rendered by Instructors in lining holdings for holes and soil conservation without charge and in generally supervising planting operations in accordance with the requirements of the subsidy replanting scheme have been mainly responsible for the satisfactory progress and good results obtained on the vast majority of smallholdings. A number of visiting agents who inspected holdings for the subsidy scheme and the Rubber Controller who is in charge of it have expressed satisfaction on the generally high standard of replanting work on small holdings.

The issue of unsatisfactory plants to permit-holders from certain nurseries for North East planting was brought to the notice of the Rubber Controller, who took immediate action to have all nurseries supplying plants inspected and reported on periodically in future.

New Planting

In spite of the heavy calls made on the time of the field staff by replanting and sulphur-dusting duties, due attention was paid to new-planting work. 4,387 preliminary reports on the suitability of holdings for new-planting were sent by Instructors to the Rubber Controller before permits were issued. 3,579 peasant and middle class permits covering 5,696 acres were issued during the year. Record sheets were maintained for all new-planting holdings and visits made and work done recorded. 181 permits comprising 253 acres were cancelled for lack of progress. A total of 16,174 visits were paid to new-planting holdings by the field staff for advice and lining.

Instructors lined 697 new-planting holdings (945 acres) for soil conservation. Rs. 13,553.54 was paid to 296 peasant-class permit-holders as soil conservation grants.

It was suggested to the Rubber Controller that the issue of new-planting permits, as is the case with subsidy replanting permits, be confined to certain specified months of the year, without issuing them throughout the year as at present. This would enable Instructors to arrange their extensive lining work on replanting and new-planting holdings in an orderly manner and avoid confusion through permits coming in at all times.

Planting Material

The decision of the Board, made in 1954, not to issue planting material to peasant-class New Rubber Planting Scheme permit-holders, on account of the heavy demand for material from subsidy replanters, was again reversed in 1955 and instructions were received that issues should be re-commenced in 1956 from material that would be available from nurseries of the Department of Agriculture. Arrangements were accordingly made for the Director of Agriculture to supply 150,000 TJ. 1 clonal seedlings, 15,000 PB. 86 budded stumps and 1,000 yards of PB. 86 budwood for issue to peasant-class new-planters during 1956. These are to be issued from various nurseries in Government Farms, which would facilitate distribution.

1,340 budded stumps of PB. 86 remaining from 1954 were sold to new-planters from the Karapincha and Eraminigolla nurseries. Instructors paid 200 visits to nurseries.

Sheet Improvement

The market price of No. 1 sheet varied from Rs. 1/30 a pound at the beginning of the year, Rs. 1/10 in March, Rs. 1/26 in July, Rs. 1/35 in August, to Rs. 1/50 in October and after. Every effort was made by Instructors to improve the quality of sheet in their ranges by means of sheet-making demonstrations, construction of specially-designed, cheap, wattle-and-daub smoke-houses, testing of coagulants, issue of mesh and latex pans etc.

434 sheet-making demonstrations were given and 500 sq. ft. of mesh for strainers and 116 aluminium latex pans were sold at concession rates. 254 samples of acid were tested. 36 demonstration and 30 private smokehouses were started and 16 demonstration and 18 private ones completed. 36 existing houses were improved. Instructors paid 3,370 advisory visits to smokehouses and 517 visits to Rubber Commissioner's Depots in connection with small-holders' sheets.

Latex Centres

164 advisory visits were paid by the field staff to Latex Centres. Owing to a number of members replanting their holdings under the Subsidy Scheme, enthusiasm in sending latex to the centres waned and 4 Centres at Dapiligoda, Pantiya, Matugama and Owitigala were closed down. The remaining 6 Centres continued to function and supplied latex to the Latex Corporation at Katukurunda.

Demonstrations

182 tapping, 119 disease control and 375 miscellaneous demonstrations were given by Instructors, in addition to the sheet demonstrations mentioned earlier.

Correspondence

General

Inward	3,142	
Outward	5,182	

With Rubber Controller

Inward	2,940	
Outward	5,315	(Including 4,387 preliminary reports)

General

The Board decided that the 2-year-course Peradeniya Certificate should be a minimum qualification for all future Rubber Instructors.

AUDITOR GENERAL'S REPORT FOR 1954

No. P-2(4)8,
Audit Office,
Colombo 7. 17th October, 1955.

THE CHAIRMAN,
Board of Management,
Rubber Research Institute,
Agalawatta.

The accounts of the Rubber Research Institute, Agalawatta (Ceylon) for the year ended 31st December, 1954 were audited under my direction.

The Financial Statements *viz:*—

(*a*) Revenue Account and Capital Account for the year, and General Balance Sheet as at December, 31, 1954;
(*b*) Dartonfield Group Working Account for the year;
and (*c*) Provident Fund Working Account for the year;

were compared with the books and accounts and found to agree. The Balance Sheet has been duly certified and is returned herewith. The following are comments which I consider necessary to offer on these accounts.

INCOME—REVENUE ACCOUNT

2. The actual income for the year amounting to Rs. 1,516,020.63 exceeded the estimated income of Rs. 1,327,446/- by Rs. 188,574.63 but was less than the actual income for the previous year by Rs. 30,917.03. A comparative statement showing the estimated and actual income is annexed marked 'A'. The reasons for variations are indicated in that statement.

3. **Dartonfield Group.**—(*a*) The Working Account of the Dartonfield Group showed a profit of Rs. 72,344.56 which exceeded the profit of Rs. 58,063.39 earned for the previous year by Rs. 14,281.17. It also exceeded the estimated profit of Rs. 38,246/- by Rs. 34,098.56. This increase in profits in 1954 is mainly due to the increase in tapping acreage resulting in an increased total yield of latex. The next reason for the increase in profits as shown by the Working Account is the lower percentage (9 per cent.) of "General Charges" allocated to the Working Account as compared with 15 per cent. charged in 1953. The amount debited on account of General Charges has accordingly been reduced from Rs. 31,579.16 in 1953 to Rs. 19,285.39 in 1954. There was also an increase in income resulting from the rise in the average selling price of manufactured rubber from -/85 cts. in 1953 to Rs. 1.01 in 1954, but against this must be offset the reduction due to the fall in the average selling price of creamed latex from Rs. 1.42 in 1953 to Rs. 1.23 in 1954.

(*b*) **Overpayment of Wages.**—An error in the rate paid *viz.* -/21 cts. instead of -/14 cts. for each pound collected by a labourer in excess of the minimum quantity of 12 lbs. payable for work done on Sundays at Nivitigalakele belonging to Dartonfield Group was pointed out to the Director by my letter

No. M-2/RRI of 2-12-1953. Although the Director undertook by his letter No. 29 of 28-1-1954 to investigate the matter and to furnish a statement of the total overpayment on this account no further report has yet been received from him.

4. **Interest on Investment.**—The interest from investments for the year amounted to Rs. 90,751.33 as compared with Rs. 92,332.29 for the previous year. This sum fell short of the estimate by Rs. 1,248.67. The shortfall is due to sale in 1954 of Rs. 100,000/- Stock of Government 3¼ per cent. National Loan at Rs. 101,375/-.

EXPENDITURE

5. **General Charges.**—As already indicated in para 3(*a*) above the basis of allocation of General Charges among the various accounts was revised as shown below:—

		1953		1954	
Revenue Account	...	46%	96,830.57	46%	98,570.23
Capital Account	...	39%	82,105.74	45%	96,426.88
Dartonfield Working Account	...	15%	31,579.16	9%	19,285.39

The data on the basis of which the allocations were revised in 1954 were not furnished for examination in audit and hence it is not possible to say whether the basis adopted is reasonable or not. It is, however, desirable to avoid as far as possible variations in the percentages fixed for allocation of these General Charges, as such variations tend to distort the accounts of one year as compared with those of previous years.

6. **Revenue Expenditure.**—The total expenditure on Revenue Account, exclusive of the provisions for depreciation (Rs. 91,917.10) and audit fee (Rs. 1,600/-) amounted to Rs. 1,074,420.43 as compared with Rs. 987,148.30 for the previous year. Although there was a reduction of Rs. 30,666.67 in the amount contributed to the London Advisory Committee and the British Rubber Producers' Association in 1954 as compared with the contributions in the previous year, the expenditure under personal emoluments, laboratory equipment and working expenses, field and factory experiments, water and power supply, etc. exceeded that of the previous year by over Rs. 117,000/-. Details of the revenue expenditure are set forth in the Revenue Account.

7. **Capital Expenditure.**—The net additions to the Capital amounted to Rs. 585,724.61 as compared with Rs. 795,478.21 in the previous year.

8. **Estimated and Actual Expenditure.**—The statement showing the approved estimates of expenditure as compared with the actual expenditure is attached marked 'B'. The reasons for variations as furnished by the Director are given against each item. Under revenue expenditure there was an excess expenditure on 9 items aggregating Rs. 11,695.14 and under capital expenditure an excess of Rs. 1,181.91 on 4 items.

The covering approval of the Board will have to be obtained for the excess expenditure. As incurring of expenditure in excess of the provisions in the approved estimates is wrong in principle the feasibility of obtaining the prior approval of the Board for incurring such excess expenditure might receive consideration.

The total savings on votes amounted to Rs. 124,676.31 on 27 items of revenue and Rs. 240,606.60 on 36 capital items.

The net savings amounted to Rs. 352,405.86.

CAPITAL ACCOUNT

9. **London Plant—Rs. 11,333.34.**—This amount which purported to be the book value of certain Plant supposed to have been held by the London Advisory Committee for Rubber Research Work on behalf of Ceylon and Malaya, was written off from the Books in 1954 with the approval of the Board as enquiries made by the Director on my suggestion revealed that no such plant was in existence.

BALANCE SHEET

Liabilities

10. **Depreciation Reserve Account—Rs. 508,850.64.**—From a sum of Rs. 91,917.10 which was provided for depreciation of wasting assets for 1954, a sum of Rs. 1,715.82 being depreciation provided for assets sold during the year was transferred to the Surplus Account in accordance with the procedure in vogue referred to in para 17 below.

11. **Provident Fund Reserve—Rs. 541,575.03.**—A sum of Rs. 10,555.57 was paid out of the Provident Fund Reserve to an officer of the Board as retiring gratuity in addition to the amount due to him under the rules of the Fund. There is no provision in the Provident Fund rules for payment of such a gratuity from the fund. This matter is under query.

12. **Medical Fund Reserve—Rs. 31,649.09.**—The balance to the credit of the Fund on 31-12-1953 was Rs. 26,816.67. A sum of Rs. 10,929.22 which included Rs. 341.05 being recovery in respect of loans granted to officers was added to the Fund. The payments inlcuding loans granted to officers amounted to Rs. 6,096.80 leaving a balance of Rs. 31,649.09 to the credit of the Fund at the end of the year. It is desirable that a working account of the Medical Fund for each year should be prepared and rendered along with the annual accounts.

13. **Payments in Advance—Rs. 67,275.45.**—Included under this head is a sum of Rs. 60,957.07 representing net expenditure incurred on establishment and upkeep of nurseries after deducting therefrom the proceeds realized from the sale of planting materials obtained from the nurseries upto the end of the year 1954. It is preferable to show this item separately in the Balance Sheet.

14. **Stock—Rs. 38,499.22.**—The stocks on hand at December 31, 1954 comprised the following as certified by the Estate Superintendent:—

Materials	...	Rs. 37,672.63
Rice and Food Stuffs	...	,, 826.59
		Rs. 38,499.22

The item "materials" shown above included an unverified book balance of Rs. 112.13 on account of timber.

15. **Investments—Rs. 2,863,150.00.**—This amount represents the total face value of the investments and not the cost price which it was suggested in para 13 of my report on the 1953 accounts might be shown in the Balance Sheet. The middle market value of the investments totalled Rs. 2,692,590.12 on the date of the Balance Sheet.

16. **Outcome of Accounts.**—To the accumulated surplus of Rs. 1,397,052.43 brought forward from the previous year was added Rs. 348,083.10 being the excess of income over expenditure for the year 1954 resulting in a total surplus of Rs. 1,745,135.53 which was further increased to Rs. 1,749,451.35 by the addition of Rs. 4,315.82 being amount realized on sale of assets plus total depreciation provided on them as explained in para 17 below. After appropriating a sum of Rs. 585,724.61 for capital expenditure a balance of Rs. 1,163,726.74 was carried forward to the year 1955. Reserves provided for Stabilization of Income stood at Rs. 1,000,000/- and for Depreciation on fixed assets at Rs. 508,850.64 at the end of the year.

17. **Value of Assets sold—Rs. 4,315.82.**—This amount represents the proceeds from sale of 3 Sulphur Dusting machines (Rs. 2,250/-) and Roneo Duplicator (Rs. 350/-) aggregating Rs. 2,600/- plus Rs. 1,715.82 provided by way of depreciation in the Depreciation Reserve and now transferred to Surplus on sale of asset. The total cost of these assets amounted to Rs. 8,350/-. Under the accounting procedure in vogue the sum of Rs. 2,600/- though a capital receipt is accounted for as a credit to the Surplus Account as all capital expenditure is met from revenue surpluses.

18. **Board of Survey Report for 1954.**—The report of the annual Board of Survey for 1954 furnished in audit is under examination.

Sgd. D. S. DE SILVA,
Actg. Auditor-General.

RUBBER RESEARCH INSTITUTE OF CEYLON

Dr. **REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1954.** **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
To ADMINISTRATION OF THE BOARD:—			By Cess Collections		1,150,929.38
Travelling Expenses of Board Members	5,507.75		„ Government Grant for Smallholdings Work		196,500.00
Entertainment of Board Members ...	2.85	5,510.60	„ Interest		90,751.33
„ PERSONAL EMOLUMENTS:—			„ Sale of Publications		1,902.43
Senior Scientific Staff	141,020.03		„ Profit from Dartonfield Group ...		72,344.56
Junior Scientific Staff	42,721.84		„ Sundry Receipts		3,592.93
Office Staff	42,015.94	225,757.81			
„ LIBRARY AND PUBLICATIONS:—					
Library	5,160.79				
Publications	12,078.67	17,239.46			
„ SMALLHOLDINGS WORK:—					
Emoluments of Staff (S.H.)	217,662.79				
Travelling and General Expenses (S.H.)	58,403.01	276,065.80			
„ LABORATORY:—					
Equipment and Working Expenses ...	27,853.71				
Furniture Replacements	290.84	28,144.55			
„ FIELD AND FACTORY EXPERIMENTS:—					
Field Experiments	47,605.81				
Factory Experiments	15,861.74	63,467.55			
„ OFFICE:—					
Stationery and Office Equipment ...	6,590.95				
Postages and Telegrams	3,693.49				
Advertising	2,865.44				
Telephone	2,111.25				
Audit	1,600.00	16,861.13			
„ TRAVELLING:—					
Travelling Expenses of Staff	25,417.31	25,417.31			
Carried Forward		658,464.21	Carried Forward ...		1,516,020.63

Dr. **REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1954** —*(Contd.)* **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
Brought Forward ...		658,464.21	Brought Forward ...		1,516,020.63
To Maintenance of Buildings, Power and Water Supply and Motor Vehicles:—					
Maintenance of General Buildings ...	2,745.83				
,, ,, Bungalows	9,960.73				
,, ,, Water and Power Supply	28,813.26				
Bungalow Furniture Replacements ...	2,681.05				
Maintenance of Motor Vehicles ...	10,575.29	54,776.16			
,, Miscellaneous Items Shared With Estate:—					
Dartonfield Group General Charges ...	98,570.23				
Upkeep of Building Premises	7,261.67				
Factory Upkeep	4,476.88	110,308.78			
,, Other Charges:—					
Contributions to L.A.C., and B.R.P.R.A.	30,000.00				
Contingencies	2,003.47				
Insurance Charges	8,304.05				
Staff Provident Fund	79,223.19				
Passages	15,000.00				
Entertainment Allowance	266.00				
Dearness Allowance to Staff	108,495.57				
Contribution to Assistant Staff Medical Fund	5,125.07				
Contribution to Senior Staff Medical Scheme	2,761.62				
Social Services	1,292.31				
Depreciation	91,917.10	344,388.38			
Balance being excess of Income over Expenditure for the year carried forward to Balance Sheet		348,083.10			
	Rs.	1,516,020.63		Rs.	1,516,020.63

RUBBER RESEARCH INSTITUTE OF CEYLON

CAPITAL ACCOUNT AS AT 31st DECEMBER, 1954

EXPENDITURE

	To December 31st 1953 Rs.	Transfers between A/cs. Rs.	Additions in 1954 Rs.	Total Rs.
To LAND INCLUDING DEVELOPMENT:—				
Dartonfield	258,458.72		67,335.32	325,794.04
Nivitigalakele	179,857.71		9,818.52	189,676.23
Hedigalla	483,925.42		195,094.80	679,020.22
BUILDINGS AND LINES DARTONFIELD:—				
Estate	212,375.08		10,361.73	222,736.81
Headquarters	601,096.56		103,934.34	705,030.90
NIVITIGALAKELE:—				
Estate	46,315.10		609.86	46,924.96
Headquarters	22,143.03		2,969.30	25,112.33
HEDIGALLA:—				
Estate	205,470.72		35,790.66	241,261.38
Headquarters	18,628.62		2,683.50	21,312.12
„ FURNITURE AND FIXED EQUIPMENT:—				
Dartonfield	132,927.48	Cr. 1,500.00	10,471.65	141,899.13
Nivitigalakele	5,733.70		—	5,733.70
Hedigalla	2,436.21		—	2,436.21
„ POWER AND WATER SUPPLY:—				
Dartonfield	144,057.48		11,457.76	155,515.24
Nivitigalakele	7,878.70		1.78	7,880.48
Hedigalla	11,482.40		5,377.76	16,860.16
„ MACHINERY AND TOOLS:—				
Dartonfield	519,562.77	Cr. 6,840.00	86,869.22	599,591.99
Nivitigalakele	4,754.23		—	4,754.23
Hedigalla	17,528.70		1,898.98	19,427.68
„ Laboratory Apparatus	122,494.00		41,049.43	163,543.43
„ London Plant	11,333.34	Cr. 11,333.34	—	—
Rs.	3,008,459.97	Cr. 19,673.34	585,724.61	3,574,511.24

RECEIPTS

	Rs. Cts.
BY REVENUE APPLIED FOR CAPITAL PURPOSES:—	
At 31st December, 1953	3,008,459.97
Less: Disposals	19,673.34
	2,988,786.63
In 1954	588,724.61
Rs.	3,574,511.24

RUBBER RESEARCH INSTITUTE OF CEYLON

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1954.

LIABILITIES	Rs. Cts.	Rs. Cts.	ASSETS	Rs. Cts.	Rs. Cts.
CREDITORS:—			DEBTORS:—		
Sundries	50,130.22		Cess Collection for December, 1954 ...	47,347.57	
Receipts in Advance	199,036.29	249,166.51	Sundries	44,304.77	
			Accrued Interest on Investments ...	23,518.23	115,170.57
PASSAGE FUND RESERVE:—					
At December, 31, 1953	31,125.27		ADVANCE ACCOUNTS:—		
Add Reserve for 1954	15,000.00		Estate Superintendent	21,096.87	
	46,125.27		SMALLHOLDINGS PROPAGANDA OFFICER		
Less Payments in 1954	12,158.00	33,967.27	General Account Rs. 892.41		
			Soil Conservation Account ,, 2,025.71	2,918.12	
DEPRECIATION RESERVE:—			London Advisory Committee ...	11,215.37	
At December, 31, 1953	418,649.36		Postmaster General	160.00	35,390.36
Add Reserve for 1954	90,201.28	508,850.64			
			PAYMENTS IN ADVANCE		67,275.45
PROVIDENT FUND RESERVE:—			STOCK:—		
At December, 31, 1953	475,673.65		Estate Stocks		38,499.22
Additions during 1954	134,357.21		LOANS:—		
	610,030.86		For purchase of transport	35,256.76	
Less Payments in 1954	68,455.83	541,575.03	R.R.I.C. Co-operative Store ...	729.15	35,985.91
MEDICAL FUND:—					
At December, 31, 1953	26,816.67				
Additions during 1954	10,929.22				
	37,745.89				
Less Payments in 1954	6,096.80	31,649.09			
Carried Over ...		1,365,208.54	Carried Over ...		292,321.51

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1954—(*Contd.*)

LIABILITIES

	Rs. Cts.	Rs. Cts.
Brought Forward ...		1,365,208.54
AUDIT FEE RESERVE:—		
At December, 31, 1953	3,748.43	
Add Reserve for 1954	1,600.00	
	5,348.43	
Less Payments	2,375.98	2,972.45
RESERVE FOR STABILISATION OF INCOME:—		
At December, 31, 1953	1,000,000.00	
Additions in 1954	—	1,000,000.00
SURPLUS ACCOUNT:—		
At December 31, 1953	1,397,052.43	
Add Excess of Income over Expenditure for 1954	348,083.10	
	1,745,135.53	
Add Value of Asset sold	4,315.82	
	1,749,451.35	
Less Contribution to Capital Outlay ...	585,724.61	1,163,726.74
Rs.		3,531,907.73

ASSETS

	Rs. Cts.	Rs. Cts.
Brought Forward ...		292,321.51
INVESTMENTS:—		
In Ceylon Govt. 3½% Loan 1957/62 ...	25,000.00	
—do— 3% War Loan 1956/60	20,000.00	
—do— 3½% National Loan 1964/69	70,000.00	
—do— 3% Sri Lanka Loan 1969/74	750,000.00	
—do— 3% Loan 1973/79 ...	600,000.00	
—do— 3% Loan 1966/71 ...	500,000.00	
—do— 3% Loan 1972/77 ...	500,000.00	
3½% Ceylon State Mortgage Bank Debentures	398,150.00	2,863,150.00
CASH BALANCES:—		
At Ceylon Savings Bank		4,347.40
In Savings Deposit (Bank of Ceylon) ...		9,536.58
In Current Account (—do—)		362,461.13
In Hand		91.11
Rs.		3,531,907.73

The accounts of the Rubber Research Institute for the year ended December 31, 1954, have been audited under my direction. Subject to the observations in the accompanying report, as a result of this audit I am of opinion that the Balance Sheet and Financial Statements above set forth have been drawn up in accordance with the Books and Records maintained by the Institute so as to present fairly the financial position of the Institute as at December 31, 1954, and the results of its operations for the year ended on that date.

Audit Office,
Colombo 7, 12th October, 1955.

(Sgd.) D. S. DE SILVA,
Acting Auditor-General.

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1954—(*Contd.*)

VALUATION OF INVESTMENTS AS AT 31-12-1954.

No.	*Investments*		*Flat price*	*Middle Market value* Rs. Cts.
1.	3½% Loan 1957/62	...	102 11/16	25,671.87
2.	3% War Loan 1956/60	...	100 1/8	20,025.00
3.	3½% National Loan 1964/69	...	101 1/2	71,050.00
4.	3% Sri Lanka Loan 1969/74	...	93 5/16	699,843.75
5.	3% Loan 1973/78	...	92 1/16	552,375.00
6.	3% Loan 1966/71	...	94 1/2	472,500.00
7.	3% Loan 1972/77	...	92 3/16	460,937.50
8.	3¼% Ceylon State Mortgage Bank Debentures	...	Rs. 49/- per Rs. 50/- share	390,187.00
				2,692,590.12

FROVIDENT FUND.

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1954.** **Cr.**

		Rs. Cts.			Rs. Cts.
To Payment to 7 retiring officers	...	68,455.83	By Balance brought forward from 1953	...	475,673.65
„ Balance Carried Forward to 1955	...	541,575.03	„ Board's Bonus for 1954 ...	...	56,501.22
			„ Interest on officers' contributions	...	9,742.75
			„ Interest on Board's Bonus account	...	11,235.63
			„ Bonus for 2 retiring officers	...	1,838.10
			„ Interest for 1954 for 5 retiring officers	...	646.79
			„ Members' contributions during 1954	...	54,392.72
	Rs.	610,030.86		Rs.	610,030.86

DARTONFIELD GROUP

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1954.** **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
To Expenditure:—			By Sale of Produce:—		
General Charges	19,285.39		Manufactured Rubber (113,161 lbs.) ...	114,375.39	
Upkeep, Manufacture and Distribution	91,003.14	110,288.53	Creamed and Ammoniated Latex (52,842 lbs.)	65,185.44	179,560.83
„ Harvesting of Food Crops	3,040.03				
Less Sales	2,140.62	899.41	„ Sale of Planting Material, etc. ...		2,422.25
			„ Sundry Income		2,373.92
„ Handling and Distribution of Planting Material		824.50			
„ Balance being excess of Income over Expenditure transferred to Revenue Account		72,344.56			
	Rs.	184,357.00		Rs.	184,357.00

ESTIMATES AND ACTUAL INCOME STATEMENT FOR 1954. **A**

	Estimate Rs. Cts.	Actual Income Rs. Cts.	Excess Rs. Cts.	Deficit Rs. Cts.	
Cess Collections ...	985,600.00	1,150,929.38	165,329.38	—	Under Estimate
Interest ...	92,000.00	90,751.33	—	1,248.67	Sale of an investment
Sale of Publications ...	2,500.00	1,902.43	—	597.57	Over Estimate
Profit from Dartonfield Group Working	38,246.00	72,344.56	34,098.56	—	Better crop and higher prices realised
Sundry Receipts	2,500.00	3,592.93	1,092.93	—	Profit on sale of an Investment
Government Grant for Smallholdings Work	206,600.00	196,500.00	—	10,100.00	Reduction of grant by Department of Agriculture

RUBBER RESEARCH INSTITUTE OF CEYLON

B

STATEMENT OF EXCESSES AND SAVINGS ON VOTES 1954

EXPENDITURE

Head of Estimate	Account	Estimate Rs. Cts.	Capital Rs. Cts.	Revenue Rs. Cts.	Excess Rs. Cts.	Saving Rs. Cts.	Remarks
1.	Administration of the Board:—						
	A. Travelling Expenses of Board Members	5,822.00		5,507.75		314.25	Over estimate.
	B. Entertainment of Board Members	250.00		2.85		247.15	—do—
2.	Emoluments of Senior Scientific Staff:—	143,200.00		141,020.03		2,179.97	Resignation of Mycologist.
3.	Emoluments of Junior Scientific Staff:—	43,190.00		42,721.84		468.16	Change in staff of Agronomy Department.
4.	Library and Publications:—						
	A. Library	6,000.00		5,160.79		839.21	Less binding of journals done.
	B. Publications	7,500.00		12,078.67	4,578.67		More publications issued and increased printing costs.
5.	Smallholdings Work:—						
	A-F & H. Emoluments of Staff	242,078.00		217,662.79		24,415.21	Five additional Instructors appointed only in middle of year and one A.P.O. (Prob.) not employed.
	G & I-J. Travelling and General Expenses	94,850.00		58,403.01		36,446.99	—do—
6.	Laboratory:—						
	A. Equipment and Working Expenses	40,000.00	630.80	27,853.71		11,515.49	Over estimate and resignation of Mycologist.
	B. Furniture Replacements	600.00		290.84		309.16	Over estimate.

STATEMENT OF EXCESS AND SAVINGS ON VOTES 1954—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate Rs. Cts.	Capital Rs. Cts.	Revenue Rs. Cts.	Excess Rs. Cts.	Saving Rs. Cts.	Remarks
7.	Field and Factory Experiments:—						
	A. Field Experiments	50,492.00	104.50	47,605.81		2,781.69	Economies in Dartonfield Group field experiments.
	B. Factory Experiments	14,400.00		15,861.74	1,461.74		Under estimate in consumption of oils etc.
8.	Office:—						
	A-C. Emoluments of Office Staff	42,460.00		42,015.94		444.06	Changes in Staff.
	D. Stationery and Office Equipment	6,500.00		6,590.95	90.95		—
	E. Postages and Telegrams	4,500.00		3,693.49		806.51	Economies
	F. Advertising	1,000.00		2,865.44	1,865.44		More advertising of vacant posts.
	G. Telephone	1,700.00		2,111.25	411.25		Shifting of telephones due to building extensions.
	H. Audit	1,600.00		1,600.00			—
9.	Travelling Expenses of Staff:—	24,418.00		25,417.31	999.31		More travelling done than anticipated.
10.	Maintenance of Buildings and Etc.:—						
	A. General Buildings	3,000.00		2,745.83		254.17	Economies.
	B. Bungalows	10,775.00		9,960.73		814.27	—do—
	C. Water and Power Supply	28,210.00		28,813.26	603.26		More repairs than anticipated.
	D. Bungalow Furniture Replacements	1,500.00		2,681.05	1,181.05		Replacements due to changes in staff.
	E. Motor Vehicles	11,375.00		10,575.29		799.71	More credit obtained for internal transport.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES 1954—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate Rs. Cts.	Capital Rs. Cts.	Revenue Rs. Cts.	Excess Rs. Cts.	Saving Rs. Cts.	Remarks
11.	Miscellaneous Items Shared with Estate:—						
	A. Dartonfield Group General Charges	108,704.00		98,570.23		10,133.77	Over estimate.
	B. Upkeep of Building Premises	7,925.00		7,261.67		663.33	Economies.
	C. Factory Upkeep	8,565.00		4,476.88		4,088.12	Economies.
12.	Other Charges:—						
	A. Contribution to L.A.C. and B.R.P.R.A.	35,000.00		30,000.00		5,000.00	No Contribution to L.A.C.
	B. Contingencies	1,500.00		2,003.47	503.47		Legal expenses in connection with tractor accident.
	C. Insurance Charges	8,500.00		8,304.05		195.95	Non completion of building programme.
	D. Staff Provident Fund	85,000.00		79,223.19		5,776.81	Changes in Staff.
	E. Passages	15,000.00		15,000.00			
	F. Entertainment Allowance	500.00		266.00		234.00	Less visitors.
	G. Dearness Allowance to Staff	111,590.00		108,495.57		3,094.43	Changes in staff.
	H. Assistant Staff Medical Fund	8,500.00		5,125.07		3,374.93	Less claims.
	I. Social Services	2,000.00		1,292.31		707.69	Economies.
	J. Senior Staff Medical Scheme	3,000.00		2,761.62		238.38	Less claims.
13.	Depreciation:—	100,450.00		91,917.10		8,532.90	Over estimate.
14.	Capital Account:—						
	A. Planting 148 acres at Hedigalla	102,868.00	94,447.87			8,420.13	Economies.
	B. Planting 10 acres at Nivitigalakele	7,459.00	6,755.64			703.36	Economies.
	C. Replanting 4¾ acres at Dartonfield	5,761.00	4,571.05			1,189.95	Economies.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES 1954—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate Rs. Cts.	Capital Rs. Cts.	Revenue Rs. Cts.	Excess Rs. Cts.	Saving Rs. Cts.	Remarks
14.	CAPITAL ACCOUNT—(*Contd.*) :—						
	D. Upkeep of Dartonfield Group Immature Areas	142,579.00	111,610.28			30,968.72	Economies.
	E. New Intermediate Staff Bungalow at Dartonfield	45,000.00	9,897.12			35,102.88	Work not completed.
	F. 1 Asst. Staff Bungalow at Dartonfield	23,000.00	20,241.73			2,758.27	Payments not completed.
	G. 15 Double and 6 Single water seal latrines at Dartonfield	4,425.00	3,655.79			769.21	—do—
	H. Bakery at Dartonfield	800.00	800.00			—	
	I. Firewood shed for S.S. Bungalow No. 6	1,000.00	914.18			85.82	—
	J. Additions and Improvements to Cottages and Lines	4,845.00	697.62			4,147.38	Payments not completed.
	K. Dispensary at Dartonfield	5,000.00	4,636.11			363.89	Economies.
	L. Improvements to Mycology Department Green House	6,000.00	4,348.60			1,651.40	—do—
	M. Improvements to Asst. Staff Bungalows	14,859.00	5,476.75			9,382.25	Work not completed.
	N. 3 Single Water seal latrines at Nivitigalakele	525.00	609.86		84.86		
	O. 6 Double Cottages at Hedigalla	40,500.00	35,265.66			5,234.34	Retention money to be paid.
	P. 3 Single Water Seal latrines at Hedigalla	525.00	525.00			—	
	Q. Water and Power Supply at Dartonfield	25,929.00	16,198.99			9,730.01	Work not completed.
	R. Water and Power supply at Hedigalla	22,654.00	7,170.74			15,483.26	—do—
	S. Laboratory Equipment for Botany Department	750.00	156.55			593.45	Part of equipment not purchased.
	T. Equipment for Agronomy Department	17,793.00	12,102.83			5,690.17	Payments not completed.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES 1954—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate Rs. Cts.	Capital Rs. Cts.	Revenue Rs. Cts.	Excess Rs. Cts.	Saving Rs. Cts.	Remarks
14.	CAPITAL ACCOUNT—(*Contd.*) :—						
	U. Machinery and Equipment for Chem. Department	104,389.00	44,322.39			60,066.61	Payments not completed and part of equipment not purchased.
	V. Equipment for Mycology Department	17,000.00	4,155.38			12,844.62	Equipment for liquid spraying not purchased.
	W. 2 Sulphur Dusting Machines (Estate)	4,000.00	3,052.00			948.00	Over estimate.
	X. Experimental Alterations or additions to existing units	25,000.00	22,457.95			2,542.05	Work not completed.
	Y. Equipment for Factory	14,687.00	9,523.18			5,163.82	—do—
	Z. Furniture for Dispensary and New Officers	1,850.00	814.19			1,035 81	Furniture for dispensary not purchased.
	A1. Typewriter and Electric Duplicator	4,000.00	3,833.00			167.00	Economies.
	B1. Additional gun for Hedigalla	200.00	106.00			94.00	—do—
	C1 New Roads at Dartonfield Group	51,220.00	36,790.68			14,429.32	Work not completed.
	D1. Community Centres at Dartonfield and Hedigalla	1,745.00	1,772.83		27.83		—
	E1. Extensions to Administrative and Botanical Blocks	38,907.00	39,099.25		192.25		—
	F1. Constant Temperature room for Chemist	1,032.00	938.80			93.20	
	G1. Improvements to Dartonfield Approach Road	17,500.00	17,500.00			—	
	H1. Saw Bench and Equipment for Workshop	619.00	302.00			317.00	Economies.
	I1. Converting Engine Driver's Quarters into work shop	955.00	408.04			546.96	—do—
	J1. 1 Junior Staff Bungalow and extensions to 2 Chummeries	2,885.00	2,753.57			131.43	—do—

STATEMENT OF EXCESSES AND SAVINGS ON VOTES 1954—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate Rs. Cts.	Capital Rs. Cts.	Revenue Rs. Cts.	Excess Rs. Cts.	Saving Rs. Cts.	Remarks
	K1. Dartonfield Factory Extension	756.00	572.21			183.79	Economies.
	L1. Electric Lighting set at Dartonfield	49,056.00	45,972.11			3,083.89	—do—
	M1. 1 Intermediate Staff Bungalow at Dartonfield	7,846.00	6,167.39			1,678.61	—do—
	N1. Stores and Garages at Dartonfield	1,969.00	2,845.97		876.97		Under estimate.
	O1. Hand roller for Hedigalla	471.00				471.00	Not purchased.
	P1. 2 Portable Gas Machines and Sheds	4,260.00				4,260.00	Machines not required.
	Q1. 6 Water seal Latrines (replacing pit types)	275.00				275.00	Work not done.

ESTIMATES FOR 1956.

(Adopted by the Board, 24th October, 1955)

Estimate of Income for 1956

1.	Cess Collections	Rs.		1,108,800
2.	Government Grant for Smallholdings work ...	,,		231,500
3.	Interest	,,		88,200
4.	Sale of Publications	,,		3,000
5.	Profit from Dartonfield Group Working	,,		38,144
6.	Sundry Receipts	,,		5,276
		Rs.		1,474,920

ESTIMATE OF EXPENDITURE FOR 1956

1.	**Administration of the Board:—**				
	(*a*) Travelling expenses of Board Members	Rs.	6,000		
	(*b*) Entertainment of Board Members	,,	250	Rs.	6,250
2.	**Personal Emoluments:—**				
	(*a*) Senior Scientific Staff ...	Rs.	158,690		
	(*b*) Junior Scientific Staff ...	,,	49,550	Rs.	208,240
3.	**Library and Publications:—**				
	(*a*) Library	Rs.	6,000		
	(*b*) Publications	,,	10,000	Rs.	16,000
4.	**Smallholdings Department:—**				
	(*a*) Salaries and Allowances ...	Rs.	268,190		
	(*b*) Travelling and General Expenses	,,	88,750	Rs.	356,940
5.	**Laboratory:—**				
	(*a*) Equipment and Working Expenses	Rs.	31,000		
	(*b*) Furniture Replacements ...	,,	600	Rs.	31,600
	Carried over ...			Rs.	619,030

	Brought forward ...			Rs.	619,030
6.	**Field and Factory Experiments:—**				
	(*a*) Field Experiments	Rs.	36,800		
	(*b*) Factory Experiments ...	,,	48,530	Rs.	85,330
7.	**Office:—**				
	(*a*) Salaries of Office Staff ...	Rs.	47,100		
	(*b*) Stationery and Office Equipment	,,	7,500		
	(*c*) Postages and Telegrams ...	,,	4,500		
	(*d*) Advertising	,,	2,500		
	(*e*) Telephone	,,	1,500		
	(*f*) Audit	,,	4,700	Rs.	67,800
8.	**Travelling Expenses of Staff:—**				
	Officers' Expenses			Rs.	24,000
9.	**Maintenance Charges:—**				
	(*a*) General Buildings	Rs.	3,200		
	(*b*) Bungalows	,,	6,500		
	(*c*) Water and Power Supply ...	,,	33,300		
	(*d*) Furniture	,,	1,500		
	(*e*) Motor Vehicles	,,	17,390	Rs.	61,890
10.	**Miscellaneous items shared with Estates:—**				
	(*a*) Dartonfield Group General Charges	Rs.	12,550		
	(*b*) Upkeep of Building Premises ...	,,	10,100		
	(*c*) Factory Upkeep	,,	7,890	Rs.	30,540
11.	**Other Charges:—**				
	(*a*) Contribution to London Advisory Committee	Rs.	4,800		
	(*b*) Contribution to B.R.P.R.A. ...	,,	150,000		
	(*c*) Contingencies	,,	1,500		
	(*d*) Insurance Charges	,,	13,200		
	(*e*) Staff Provident Fund ...	,,	91,800		
	(*f*) Passages	,,	15,000		
	(*g*) Entertainment Allowance ...	,,	500		
	(*h*) Dearness Allowance to Staff ...	,,	111,400		
	(*i*) Assistant Staff Medical Fund ...	,,	7,500		
	(*j*) Senior Staff Medical Scheme ...	,,	3,000		
	(*k*) Social Services	,,	2,200	Rs.	400,900
		Carried over		Rs.	1,289,490

	Brought forward		Rs. 1,289,490
12.	**Depreciation**		Rs. 119,900
13.	**Renovations and Repairs** ...		Rs. 9,430
14.	**Establishment and Upkeep of Nurseries**		Rs. 7,960
	TOTAL		Rs. 1,426,780

CAPITAL EXPENDITURE

1.	**Agricultural Development**	Rs.	288,075
2.	**Buildings**	,,	55,050
3.	**Roads**	,,	18,300
4.	**Vehicles**	,,	10,500
5.	**Equipment etc.**	,,	32,400
6.	**Miscellaneous**	,,	950
		Rs.	405,275

SUMMARY

Income			Rs. 1,474,920
Expenditure:—			
Revenue (Recurrent)	Rs.	1,426,780	
Capital	,,	405,275	Rs. 1,832,055
Excess of Expenditure over Income ...			Rs. 357,135

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