

Annual Report of the Rubber Research Institute of Ceylon.—1956.

The present report is the twenty-sixth 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.

DIRECTOR'S REPORT

By

E. D. C. Baptiste.

A five-year programme of development of the work of the Institute, submitted by the Director and considered by the Administrative Committee, was approved by the Rubber Research Board.

The major lines of development would consist of:—

1. The establishment of a Plant Breeding Department or Section, and the engagement, through the U. S. A. Operations Mission to Ceylon of a qualified plant breeder, with actual experience of Hevea breeding under the United States Department of Agriculture Co-operative Hevea Rubber Development Programme in Latin America, on an assignment of two to three years to organize the new Department and to advise on its programme of work. The officer concerned would work in close collaboration with the Botanist and would be expected to train a Ceylonese graduate to succeed him in this important line of production research.
2. A halt in the expansion of the Hedigalla Station (693 acres) which, because of its unsuitability for critical field experiments, will not be further developed after 1956, and, instead, the gradual establishment of three substations, each of approximately 200 acres, on old rubber land situated in other rubber growing districts of Ceylon, (Kegalle, Kelani Valley/Ratnapura and Galle areas).
3. A direct exchange with the United States Department of Agriculture of twenty-five Latin American Hevea clones, resistant to South American leaf blight (*Dothidella ulei*), which are either good breeding clones or are also resistant to *Phytophthora palmivora* in

Costa Rica, where the disease is present in a virulent form all the year round. These clones, established in a quarantine station of the United States Department of Agriculture outside the American tropics (Miami, Florida), would be sent to Ceylon through the Commonwealth Mycological Institute, Kew, England, in exchange for the same number of Ceylon clones.

4. An extension of the research and advisory activities of the Institute entailing the recruitment of an additional Ceylonese graduate Research Assistant in each Technical Department and an increase of laboratory staff, accommodation and equipment.
5. A gradual extension of a sulphur dusting scheme for the control of Oidium on smallholdings to cover over a period of five years almost the entire extent of economic rubber smallholdings in the Island.

Sulphur dusting on an island-wide scale would be expected to be a practical and economic proposition as the result of extensive and successful trials carried out during 1955 and 1956 by the staff of the Smallholdings Department of the Institute.

Implementation of these plans will depend on additional income being made available to the Institute in the form of grants and of an increased cess. Representations have already been made to the Industry for its approval of the proposed increase of the rubber research cess before the application is submitted to Government.

Among the more important achievements or decisions made during the year may be mentioned:—

- (a) The successful solution by the Smallholdings Department of the problem of a practical and economic sulphur dusting scheme for the control of Oidium on rubber smallholdings by the formation of co-operative groups in the various districts.
- (b) Government's consent, on representations from the Industry, for the payment of the yearly contribution of Rs. 150,000 to the British Rubber Producers' Research Association, towards the cost of consumption research, thus relieving the Rubber Research Institute of this charge on its revenue as from the end of 1956. This contribution will in future be made at Government level out of the Rubber Control Cess.
- (c) The establishment of a 32-acre rubber nursery for the Rubber Replanting Subsidy Scheme on land newly opened from jungle on Hedigalla Station, and of a further area of 20 acres of temporary nursery land on the same estate, by the siting of nursery beds between rows of plants spaced 30 feet apart in a young clearing.

The Egal Oya rubber nursery of 87 acres, reputed to be the world's largest rubber nursery, established in 1953 and maintained up to the end of 1956 by the Rubber Research Institute, is to be handed over to the Rubber Control Department on 1st January, 1957.

The total acreage of rubber nurseries opened up and planted to date for the Rubber Replanting Subsidy Scheme amounts to approximately 140 acres.

- (d) The experimental material available for planting out in 1957, to be established in plots, each of one task size, on about 40 acres of rubber replanting on two estates in the Kalutara district within easy reach of Dartonfield. Arrangements have been completed to establish twenty-one new clones in trials on these estates.
- (e) The staff and work of the ex-technical unit of the London Advisory Committee for Rubber Research (Ceylon and Malaya) at the Imperial Institute, South Kensington, London, to be transferred early in 1957 to the British Rubber Producers' Research Association laboratories at Welwyn Garden City.
- (f) The participation of the Institute in the Royal Agricultural and Food Exhibition held in Colombo during January and February, in conjunction with the Rubber Control Department.
- (g) The successful negotiations with the Pusat Perkebunan Negara of Indonesia, the proprietors of clone LCB 1320, resulting in the declaration of this vigorous high yielding clone as a "free" clone in Ceylon with no sale restrictions whatever.

STAFF

Senior Staff:

The Director, Dr. E. D. C. Baptiste, arrived in Ceylon from Malaya on 19th February, and was on duty during the rest of the year. He had served on the staff of the Rubber Research Institute of Malaya for 20 years when he resigned his post of Head of the Botanical Division on his appointment as Director of the Rubber Research Institute of Ceylon.

The Botanist, Mr. C. A. de Silva, who had been acting as Director since 7th October, 1955, reverted to his substantive post when the Director assumed duties at Dartonfield. His end-of-contract leave due on 31st October was postponed until mid January, 1957.

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

The Agronomist, Mr. D. H. Constable, returned from home leave and resumed duties on 1st February.

The Plant Pathologist, Dr. A. Riggenbach, was on duty throughout the year.

The Smallholdings Propaganda Officer, Mr. W. I. Pieris, retired from service on 30th September. The retirement of Mr. Pieris, who had been in the service of the Institute for 26 years and who had been in charge of the Smallholdings Department since its inception in 1936, is a great loss to that Department and to the Institute. Mr. R. T. Wijewantha was appointed in his place and reported for duty on 1st July.

The Administrative Secretary, Mr. C. D. de Fonseka, was on three months' end-of-contract leave from 4th June and was on duty for the remainder of the year.

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

The Technical Assistant to the Director, Mr. O. S. Peries, was appointed Assistant Plant Pathologist with effect from 22nd October. He was on duty throughout the year.

Intermediate Staff:

Mr. D. M. Fernando, Assistant Plant Breeder, was on duty throughout the year.

Mr. A. J. Jeevaratnam, Research Assistant (Agronomy Department), resumed duties on 17th May on his return from the Waite Agricultural Research Institute, South Australia. He was successful in obtaining the degrees of B.Ag.Sci. and M.Ag.Sci. of the University of Adelaide during his post-graduate training under the Colombo Plan.

Mr. M. Nadarajah, Research Assistant (Chemistry Department), proceeded on a Colombo Plan Scholarship, on 6th September, for two years' post-graduate research at Birmingham University.

Mr. L. B. Chandrasekera, Research Assistant (Botany Department), proceeded on a Colombo Plan Scholarship, on 8th September, for two years' post-graduate training at Cambridge University.

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

With effect from 1st October, Mr. K. Wilson de Silva, A.P.O. (South) was transferred to the Northern Division, and Mr. H. H. Peiris, A.P.O. (North) was transferred to the Southern Division. These two officers were on duty throughout the year.

Assistant Staff:

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

One Office Assistant	One Senior Accounts Clerk
Four Clerk-Typists	One Pay Clerk
One Record Clerk	Two Junior Accounts Clerks
One Junior Clerk	One Store Keeper
One Clerk Librarian	

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 Assistant Staff of the Institute formed themselves during the year into the Rubber Research Institute of Ceylon Employees Union, which has been registered under the Trade Union Ordinance No. 14 of 1935.

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

Senior Staff Grade I	...	8
Senior Staff Grade II	...	1
Intermediate Staff	...	7
Assistant Staff	...	88
Minor Staff	...	39
Total	...	<u>143</u>

Revised salary scales and terms of service for new entrants to the staff of the Institute in line with the new salary scales of the Tea and the Coconut Research Institutes will come into effect on 1st January, 1957.

General:

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

Meetings:

The Director attended the following meetings:—

Rubber Research Board	6	(On 28/2, 19/3, 21/5, 14/8, 22/10, 19/12).
Administrative Committee, R.R.B.	5	(On 28/2, 28/4, 28/9, 8/10, 30/11).
Smallholdings' Committee, R.R.B.	1	(On 21/9).
<i>Ad-hoc</i> Committees, R.R.B.	6	(On 15/3 (two), 11/4, 15/5, 21/9, 28/11).
Rubber Replanting Advisory Board	5	(Acting Director on 11/1, 23/1, 1/2, 9/2, 22/2).
Rubber Replanting Advisory Board	22	(Director on 9/3, 23/3, 12/4, 2/5, 17/5, 4/6, 15/6, 27/6, 6/7, 17/7, 26/7, 2/8, 17/8, 24/8, 7/9, 18/9, 8/10, 31/10, 12/11, 20/11, 4/12, 28/12).
Central Board of Agriculture	2	(On 25/6, and 26/10).
Low Country Products' Asso- ciation	5	(On 24/3, 21/6, 16/8*, 20/9, 18/12).
Planters' Association of Ceylon	8	(On 23/3, 10/4*, 17/4*, 19/6, 14/8, 25/9, 16/10, 13/11).
District Planters' Associations:—		
Sabaragamuwa	1	(On 27/7*).
Kelani Valley	1	(On 12/7*).
Kurunegala	2	(On 30/6*, 27/10).
Southern Province	1	(On 9/6*).
Kalutara District	3	(On 11/5, 3/8, 16/11*).
The Chemical Society of the University of Ceylon	1	(On 10/8*).
R.R.I.C. Senior Staff Com- mittee	6	(On 27/2, 26/3, 1/8, 19/10, 14/11, 26/11).

75

* These meetings were addressed by the Director.

Estate Visits:

Forty-one estates and several smallholders' replantings in the Kalutara, Kegalle, Avissawella and Ratnapura districts were visited by the Director during the year.

Other Visits:

The Director visited the Tea Research Institute, the Coconut Research Institute, and the Ceylon Institute of Scientific and Industrial Research.

Correspondence:

Correspondence figures for 1956:—

		<i>Inward</i>	<i>Outward</i>
Head Office	{ Administrative ...	5,186	4,349
	{ Technical ...	361	460
Botany Department ...	...	251	229
Plant Pathology Department ...	...	972	1,132
Agronomy Department ...	...	486	558
Chemistry Department ...	...	493	463
Smallholdings Department	{ General ...	3,529	7,289
	{ Rubber Replanting & New Planting ...	2,983	5,313
	{ ...	1,135	1,642

A substantial increase in the volume of correspondence of the Plant Pathology, Smallholdings and Estate Departments has occurred during the year.

The issue of advisory circulars continues to ease the correspondence of the other technical departments.

Publications:

The following publications were printed and issued during the year:—

- Report of the Work of the Rubber Research Board for 1955.
- Combined 3rd and 4th Quarterly Circulars for 1955.
- Combined 1st and 2nd Quarterly Circulars for 1956.
- Advisory Circular No. 58—Notes on Budgrafting Procedure.
- Advisory Circular No. 59—Manuring of Rubber.
- S.H. Folders No. 1—White Root Disease of Rubber, No. 2—Pink Disease of Rubber and No. 3—Bark Cracking in PB 86.

The following notes and memoranda were prepared by the Director:—

1. Advisory Leaflet on "Tree Damage", jointly with Agronomist.
2. A Clone of *Hevea pauciflora* resistant to *Dothidella* and to *Phytophthora*.
3. Natural Rubber Research—Too Little and Too Late?
4. Natural Rubber—Research and Development.

5. Director's Report for the first half-year 1956.
6. Programme of Planting and Breeding work at Hedigalla.
7. Exchange of clones between Ceylon and America.
8. Proposals for continuation of the work of R.R.I.C. and for the Improvement of its Finances.

Visitors:

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

- Professor G. E. Blackman, Sibthorpien Professor of Agriculture, University of Oxford.
 Mr. D. Rhind, Secretary for Colonial Agricultural Research, Colonial Office, London.
 Mr. D. W. Hawkins, General Manager, Dunlop Plantations Ltd., London.
 Dr. Felisberto C. de Camargo, Ministerio de Agriculture, Brazil.
 Mr. C. A. Meakin, Director of the Ceylon & Eastern Agency Ltd. and the Grand Central (Ceylon) Rubber Estates Ltd.
 Mr. A. H. Marshall, Morison Rutherford Co., London.
 Mr. L. J. Collings-Wells, Dept. of Agriculture, Nairobi, Kenya.
 Mr. L. B. Thrower, Dept. of Agriculture, Papua, New Guinea.
 Mr. R. Himson, Dept. of Agriculture, Papua, New Guinea.
 Members of the Administrative Committee of the Rubber Research Board.
 „ „ Rubber Replanting Advisory Board.
 „ „ Trade Delegation from China.

Professor G. E. Blackman spent five days in Ceylon on his way to Malaya. Two days were spent on Dartonfield and two days on visits to rubber estates and Government Stations accompanied by the Director. On the last day he was entertained by the Rubber Research Board to an official luncheon and he attended a meeting of the Board, which he addressed on the need for intensified research on natural rubber.

Dr. F. C. de Camargo also spent five days as a guest of the Director. He visited the Institute and, accompanied by the Director, five rubber estates. It was Dr. de Camargo who, as Director of the Instituto Agronomico do Norte, Belem, Para, Brazil, authorised the export on an exchange basis to the Eastern Hemisphere, of 25 *Dothidella*-resistant clones which are now represented in Ceylon.

Professor G. E. Blackman and Mr. D. Rhind are members of the Agricultural Sub-Committee, and Mr. C. A. Meakin is a member of the General Committee, of the London Advisory Committee for Rubber Research (Ceylon and Malaya).

NOTES ON DEPARTMENTAL REPORTS

Botany:

Some 30,000 hand pollinations were made during the main flowering season under the supervision of the Assistant Plant Breeder but owing to severe storm damage and a heavy incidence of pod rot caused by *Phytophthora palmivora* the final results have been very poor, only 108 legitimate seedlings being established in the hand-pollination nurseries.

A selection has been made of Ceylon, Malayan, Indonesian and Indo-Chinese "exchange" clones and twenty-six of these clones have been established in observation plots of 300 trees of each clone in the 1956 clearings of Hedigalla Division and on Dartonfield.

A number of RRIC clones made from legitimate seedlings of the 1939 hand-pollination programme and established as 5-tree-clones in a trial on the Nivitigalakele and Hedigalla Divisions have maintained their early promise.

Clone RRIC 52, established in 1944 from a high yielding Tjikadoe seedling, shows desirable characters of vigour and disease resistance. A large scale trial in which this clone is represented was brought into tapping on 1st July, 1956.

Tapping and yield recording of selected clones and clonal seedlings have continued on the three experimental stations of the Institute.

The highest yielding families are of the cross RRIC 8 \times Wag 6278 and PB 86 \times PR 107 which yielded 20 lb. or more of dry rubber per tree in the sixth year of tapping and of the cross PB 86 \times Wag 6278 which gave 16 lb. per tree in the fourth year of tapping. Seedlings of the cross RRIC 8 \times Tjir 1 yielded about 18 lb. per tree in the seventh year of tapping.

The highest yielding clones with yields of 20 lb. or more per tree in 1956 are, with the year of tapping shown between brackets, clones RRIC 22(9), 28(6), 31(6), 33(6), 36(6), 39(6), 40(6), 41(6), 42(6), 45(6), 46(6), 47(6), 50(6), 51(9), 54(4), 55(4), 59(6), 60(6), 64(3), 68(7), 73(7), 75(6), 76(6), 78(3), 79(6) and of these, clones 28, 36, 41, 45 and 75 have yielded 30 lb. or more per tree.

The highest yield recorded is that of clone RRIC 45 (3 trees) which gave nearly 40 lb. per tree in its twelfth year of age (1956) when tapped on the half spiral alternate day system.

Arrangements have been made to bring into tapping during the first half of 1957 about 1,400 five-tree-clones established in 1950 on Dartonfield and on outside estates.

Several *Dothidella*-resistant clones obtained from the Rubber Research Institute of Malaya in 1955/56 have been used for crown budding an area of 4 acres of clone PR 107 on Hedigalla Station to find out whether any of these clones possesses some degree of resistance of *Oidium* and also to obtain flowers for pollination purposes.

If certain of the clones, which are known to be resistant to *Dothidella* (South American Leaf Blight) and to *Phytophthora* in Latin America, are shown to be also resistant to *Oidium* they would make excellent crown budding clones for use under Ceylon conditions.

The results of a crown budding experiment at the end of the second year of tapping have shown no significant difference in yield or in growth with heights of crown budding of 5 feet and of 8 feet from the ground.

The best growth of the centre pieces has, so far, been obtained with a crown of clone AVROS 256, the most vigorous but the lowest yielding clone (out of six) in the experiment, and with a crown of clone Rubana 393.

The best yields have been obtained with a crown of clone PB 86, the highest yielding clone in the experiment, and the second best yields with a crown of clone Glen 1. The poorest yields have been obtained with a crown of clone PM 17, a poor yielder with a sparse crown. Crown budding of the six clones represented in this experiment was carried out when buddings were four years old instead of the more usual age of 18 to 24 months.

Crown budding has resulted in a loss of girth of nearly $4\frac{1}{2}$ inches two years after the budding operation.

Plant Pathology:

The incidence of *Oidium heveae* was mild during the wintering season of 1956, owing to effective control by sulphur dusting and to dry conditions prevailing at the time of refoliation, and very little shedding of young leaves or of flowers took place in most districts.

Oidium is now controlled most effectively by sulphur dusting.

Because of the heavy fruiting experienced as a result of the survival of the flowers the incidence of leaf fall and of bark rot caused by *Phytophthora palmivora* was heavy in the wet districts during June and early July. Owing to the failure of the N.E. monsoon a second attack of *Phytophthora* did not occur later in the year.

Phytophthora palmivora is readily controlled under field conditions by copper fungicides used either as solution (in the nursery) or as dust (in the field), but there is a great risk of latex and scrap contamination leading to tackiness of the rubber sheet or crepe.

Dusting experiments with fungicides of the dithio-carbamate type for the control of *Phytophthora* have had to be postponed until 1957 as these, although ordered at long notice, failed to arrive in time to be included in the experiments carried out during the main *Phytophthora* season of 1956.

Gloeosporium alborubrum was found associated with *Oidium* on young leaves. It was also commonly found in association with *Phytophthora* on the typical *Phytophthora* lesions found on leaf petioles and on young pods. *Gloeosporium alborubrum* was found to be affected neither by sulphur (wetttable or non-wetttable dust) nor by copper fungicides, in tests carried out in the laboratory.

The incidence of *Fomes (Leptoporus) lignosus* continues to be high in some replanted areas on estates and smallholdings. *Fomes* has been successfully cultured in the laboratory on a wide range of media and the effect of several fungicides on the fungus in culture is being studied. Promising results have been obtained with certain fungicides and these will be further tested under field conditions.

Sulphur has been shown to be quite ineffective against this fungus.

Agronomy:

Sites have been chosen for three additional manurial experiments to be set up in 1957 on three estates situated in widely separated districts. Two other experiments have been started this year thus making a total of sixteen manurial trials.

The overall picture obtained from the eleven older manurial experiments is:—

- (a) A clear need for Nitrogen which may in general be expected to result in 10 per cent. better growth.
- (b) A small but consistent positive effect of potash, and
- (c) a positive effect of phosphate but less marked than that of potash.

The effect of these three main elements shows an increase in the second or third years.

The work on leaf analysis for the investigation of their mineral content has been continued and investigations of zinc content have not confirmed a suggestion from the Rubber Research Institute of Malaya that zinc shortage may, under Ceylon conditions, be a predisposing factor to Oidium attack.

Weed eradication experiments on three estates have been continued and the best results have been obtained with a mixture of Amizole and pentachlorophenol (both at half strength). Kill was very rapid and the effect lasted for at least six weeks.

Work has begun on a soil survey and soil samples collected from seven estates are being examined for several properties. Investigations are also in progress on the use of bacterial cultures, obtained from Australia and Malaya, for legume inoculation.

Chemistry:

The effect of certain adulterants and of excessive proportions of anti-coagulants on the metrolac determination of the d.r.c. of latex has been studied.

Small scale trials have indicated that addition of 0.06% formaldehyde to latex from slaughter tapped trees may provide the solution of pre-coagulation difficulties.

A warning is given to the effect that replacements of formic and acetic acid as latex coagulants by hydrochloric or sulphuric acid may result in corrosion of milling equipment and in production of poor quality rubber.

Advice has been given on the correct operation of the Guthrie Cadet mill and on the avoidance of rust on smoked sheet.

Experiments are in progress on the effect of relative humidity on drying time of R.S.S. air dried sheet and crepe, on the design of temporary type smoke-houses and on modifications of existing types of permanent smoke-houses for specific requirements.

Information leaflets on bale coatings and bale marking paints have been prepared and circulated to packers. Advice has been given on production methods of crepe using oxalic acid in place of formic or acetic acid. The use of oxalic acid for the preparation of latex crepes without a fraction but with RPA. 3 has been favourably reported on from several quarters.

Work is in progress on the control of fractional coagulation by addition of soluble calcium salts to the latex and on the bleaching of latex for crepe manufacture by the use of RPA. 3 with calcium chloride and various coagulants.

Of increasing importance is the danger of excessive copper contamination of the latex by copper—containing fungicides used for the control of *Phytophthora*. It has been found that under certain conditions serious contamination can occur rather frequently, particularly with scrap crepes.

The effect of certain organic fungicides used for the control of *Phytophthora*, such as Femspray, on the properties of the latex and rubber is being investigated.

The Latex Corporation of Ceylon closed down at the end of the year. The immediate effect on the Institute was the winding up of two smallholders' latex centres and enquiries from a well known firm of shoe manufacturers for alternative local sources of latex concentrate.

Smallholdings:

This Department's most important achievement of the year was the successful extension of a scheme, tried successfully in 1955, for the sulphur dusting of smallholdings by forming smallholders in different areas into co-operative "groups" who, after the necessary training in the use of dusting machines under the supervision of Rubber Instructors of the Smallholdings Department, would themselves carry out the dusting operation.

Each group was loaned a dusting machine and the cost of sulphur dust was met from a contribution of Rs. 15/- per acre by every member of the group.

Sixteen dusting groups operated during the 1956 Oidium season, dusting 315 holdings comprising 1,633 acres at an overall cost of Rs. 17.97 per acre.

The cost of additional staff and of dusting machines for this scheme was defrayed by the Rubber Control Department and the Rubber Controller's assistance in this matter is gratefully acknowledged.

The scheme, judging by the excellent results obtained, was an unqualified success and arrangements were completed before the end of the year to enlarge the scheme further in 1957 by the formation of 30 dusting groups.

The tempo of work for the Rubber Subsidy Replanting Scheme continues unabated and Rubber Instructors during the year lined 4,389 acres on 3,036 holdings for planting holes and 3,804 acres on 2,417 holdings for soil conservation work.

The Department's advisory work in connection with New Rubber Planting is one of its major functions. All areas are inspected by Rubber Instructors who report on their suitability for rubber growing before permits are issued by the Rubber Control Department.

During the year the Rubber Instructors submitted 4,720 such reports to the Rubber Controller. They lined 1,335 acres in 939 areas for planting holes and 1,285 acres in 1,009 areas for soil conservation work.

A survey of white root disease incidence on smallholdings replanted between the years 1953 and 1956 under the Rubber Replanting Subsidy Scheme was initiated during the year and will be completed in 1957.

Rubber Instructors continued their demonstrations of sheet making, tapping, disease control and their numerous visits of inspection of smoke-houses in the course of their advisory duties to smallholders in their range.

A simplified form of advisory leaflet on three diseases of the rubber tree was issued in Sinhalese for the use of smallholders and other leaflets on aspects of rubber cultivation and manufacture are in course of preparation.

Six additional Rubber Instructors were recruited during the year, bringing the total field strength of the Department to 54.

Estate:

The total planted acreage of the three Divisions of the Dartonfield Group by the end of the year was approximately 1,010 acres, of which 323 acres were in tapping.

The crop harvested during the year exceeded the estimate by approximately 24,700 lb. and represented a yield of 635 lb. per acre on the tapped area.

Rainfall on Dartonfield Division was about 38 inches less than in 1955 and in the first quarter was the lowest for the last five years.

Oidium incidence was mild and Phytophthora was confined to only certain areas of the Group.

The Superintendent continued to visit the Rubber Replanting Subsidy Scheme nursery of 87 acres at Egaloya which is now in full production. In addition to the 32-acre nursery opened during the year from jungle on Hedigalla Station for the Rubber Replanting Subsidy Scheme and planted with selfed seedlings of Clone Tjir 1, a further area of 20 acres of temporary nursery beds between rubber rows spaced 30 feet apart in a young clearing was planted with Tjir 1 seedlings.

The total strength of the Estate Department monthly paid staff is 44.

The appointment of a Clerk of Works to take general charge of the maintenance services in regard to the Institute's buildings and equipment was approved by the Rubber Research Board.

The Visiting Agent paid two visits to the Group during the year.

Departmental Reports:

The reports of the various departments follow under their respective headings.

REPORT OF THE BOTANY DEPARTMENT

By

C. A. de Silva.

SUMMARY

Field Experiments:

The field experiments supervised by the Botany Department extend over an area of 746½ acres out of a total planted acreage of approximately 1,010 acres on the three estates of the Rubber Research Institute.

Hand-pollinated seedlings and five-tree-clones, established from these seedlings, are planted on 50 acres on 9 commercial estates. Approximately 185½ acres are in tapping, and 561 acres planted from 1950 to 1956 with selected material are immature. In the latter areas girth measurements are taken from the second year of growth.

A total of 6,521 budded and seedling trees were test-tapped during the year under review on a per tree basis in most field trials. In a few experiments the yields are recorded on a plot basis.

The results are presented and commented on under appropriate subject headings, as a combined report for the three estates of the Institute. The results in former years were elaborated somewhat in dealing with the work on the three estates in three separate sections. The information in the tables have been reduced to a minimum and subjects of more immediate importance to the planting industry have been given priority.

Advisory Work:

The correspondence in general has been reduced considerably in recent years due to the circulars and advisory publications that have been issued by the Smallholdings and Rubber Controller's Department, especially in connection with the Government Replanting Subsidy Scheme. The Botany Department has made a substantial contribution to the subject matter in these publications.

In recent years visitors to Dartonfield Estate from overseas and the local planting community have increased. A considerable amount of time has been taken up with discussions on topical rubber planting subjects, and with visits to and demonstrations at the experimental stations. The enquiries have been mostly confined to replanting schemes and tapping problems.

The Botanist has also been called upon to advise on the suitability of areas, which are being allocated under the colonisation scheme for rubber planting. A considerable increase in advisory work in this connection is foreseen.

Breeding and Selection:

Clonal Seedlings.—In the 1947 clonal seedling trial, seedlings of clone Tjir 1 have given 7.4 lbs. dry rubber per tree per year compared with 7.6 lbs.

for budded Tjir 1. There are still 150 trees per acre in this area, and a further thinning out of trees in 1957 should considerably improve the yields on a per tree basis.

A greater part of the earlier hand-pollinations were carried out on trees of clones PB 86, PB 5/139, Tjir 1, AVROS 163, AVROS 157, BR 2, RRIC 8, Wag 6278, Mil 3/2 and a high yielding Tjikadoe seedling tree TKD 113. These clones and seedling female parents were selected primarily for high yields and good seed setting qualities. The families representing crosses with the better known local and foreign clones have turned out to be reliable clone parents as indicated by the results obtained from test-tapping of H.P. seedlings planted up to 1947 in Tables I, II, V, VII, IX and XA.

'Selfed' seed of clone PB 86 is not recommended, but crossed seed of clone PB 86 collected in contact boundaries on local estates should be very useful in collections of mixed clonal seed, especially crosses of clones PB 86 with clones Tjir 1, Wag 6278, Glen 1 and Mil 3/2.

In general, "selfed" seed of clone Tjir 1 can be expected to be the most reliable material available at the present time in quantity from local sources.

The hand-pollination programmes from 1950 to 1956 have been focussed on more specific crosses, which include sibs, half sibs, back crosses and selected outcrosses, which have not given spectacular results in the production of viable seed. We have, however, established a fair amount of H.P. seedlings in our nurseries for a study of this material produced in a second phase of our pollination work.

A start was made in breeding material for resistance to disease by crossing high yielding clones with the Oidium resistant clone LCB 870. This material has been handed over to the Pathology Department. Clone LCB 870, although resistant to Oidium heveae, can be badly attacked by Phytophthora. It is also a very poor yielder. It is improbable that this early work will produce a clone which is resistant to both Oidium and Phytophthora diseases.

We have in 1955 imported 25 Latin American clones of the F and FX series from America through the R.R.I. of Malaya. These clones are resistant to Dothidella (South American leaf disease) and some of them to Phytophthora. The next stage of our breeding work will be carried out with these clones, after they have been tested for the incidence of Oidium heveae. Clone F 4542 is known to be resistant to both Dothidella and Phytophthora diseases, and if this clone is found to be resistant to Oidium, it will be the ideal clone for crown budding in the future. In the meantime a start has been made in 1956, by crown budding a 4-acre-area of clone PR 107 with the 25 F and FX clones for pollination work and observations on the incidence of Oidium. This work will be done in collaboration with the Plant Pathologist.

Performance of clones:

Local clones.—Yields of the best yielding RRIC clones in 1956 are given in the attached table.

Clones RRIC 2 to 7, are on test in a second trial with 75 trees of each. Clones RRIC 5, 6 and 7 are yielding over 12 lbs. dry rubber per tree, per year in a very poor area on Hedigalla. The yields are very promising.

Clone RRIC 52 is especially commented on in the detailed report. This clone is a most vigorous grower. The average girth of the 4 original budgrafts is 44.8 inches at 12 years of age and the bark is 10 mms. thick. The clone has luxuriant foliage and is definitely shade tolerant. It winters only partially each year, commencing about the 10th year of growth, and is comparatively

free of both *Oidium* and *Phytophthora* leaf diseases. The clone is worth a trial on most estates. The high yields given below for the fifth tapping year are partially due to its outstanding girth. Inherently, it is a moderately high yielding clone.

Clone	No. of trees	Yield in lbs. dry rubber per tree in tapping year:				
		1st	2nd	3rd	4th	5th
RRIC 52 ...	4	7.2	8.3	13.1	12.7	25.0

The yield for the 5th year of tapping is only approximate. The four original budgrafts were tapped throughout the year but owing to an oversight the yields were not recorded during the period July to November inclusive.

Foreign clones.—Clones PB 86, AVROS 255, PB 6/50, PR 107, RRIM 501, PB 5/60, LCB 1320 are the best yielding clones in our field trials of foreign clones.

Yields of selected RRIC clones, in 1956, in lb. per tree per year.

Clone	Year of planting	Year of Tapping									
		2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
RRIC 9	1941 N								19.1		
" 16	"								19.1		
" 22	"								28.5		
" 51	"								20.1		
" 28	1944 N					37.1					
" 30	"					19.4					
" 31	"					24.7					
" 39	"					27.7					
" 40	"					21.9					
" 41	"					33.8					
" 42	"					25.3					
" 45	"					39.6					
" 59	"					20.4					
" 60	"					24.6					
" 33	1943 H					23.8					
" 35	"					20.3					
" 36	"					29.8					
" 37	"					18.7					
" 46	"					23.0					
" 47	"					26.9					
" 50	"					22.9					
" 74	"					19.3					
" 75	"					37.6					
" 76	"					26.4					
" 79	"					22.3					
" 54	1946 H			20.9							
" 55	"			22.4							
" 57	"			14.7							
" 61	"			17.0							
" 77	"			16.1							
" 64	1947 H		22.6								
" 65	"		15.2								
" 78	"		23.0								

N = Nivitigalakele.
H = Hedigalla.

Crown Budding Experiments.—In an area of 17 acres of clones PB 86, RRIM 501, Nab 12, 15 and 20, the trees, two years after crown budding, are 4.3 inches behind the girth compared with an equal acreage of trees not crown budded. Clone LCB 870 has been used for crown budding, as a control against *Oidium heveae*.

In a large scale crown budding experiment with 6 clones, both high and low yielding, the early yields of the budded centre sections indicate that the vigour and foliage spread of the crowns are the important factors that influence the yields of the centre sections, which are inherently high yielding.

No difference in yield have been found on trees crown budded at a height of 5 and 8 from ground level. Crown budding at a height of 6 feet is recommended at the present time, as a safe compromise based on these early findings. This enables crown budding to be carried out by the average height budder with the aid of a short stool.

Avenue systems of Planting.—An area of 34½ acres planted 6' × 45' in 1949, on the contour, has been tapped for the first time from July to November, 1956. The yields of the better known clones are given below:

Clone	No. of trees tapped	Yield in gms. d.r. per tree per tapping
PB 86	128	25.0
RRIM 501	104	17.5
RRIM 513	117	22.1
Nab 17	145	24.7
Nab 16	94	25.6
PB 6/50	156	25.6
RRIC 52	138	13.3
Lun N	96	13.6

The early indications are that both growth and yield in this spacing of 6' × 45' are very satisfactory. Our general recommendations for planting budded rubber spaced 8' × 30' on the difficult rubber planting terrain in this country are therefore justified.

The results from a number of estates which have planted 6' × 40' on the contour will be of considerable interest.

Budwood Distribution.—615 yards of selected RRIC clones have been supplied to commercial estates in small quantities for purposes of multiplication and trial on a small scale.

DETAILED REPORT

Staff:

Mr. C. A. de Silva, Botanist, acted for the Director from 7th October, 1955 and reverted to his post of Botanist on the arrival of the newly appointed Director on the 19th February, 1956.

Mr. D. M. Fernando, Assistant Plant Breeding Officer, was on duty throughout the year.

Mr. L. B. Chandrasekera, Research Assistant, proceeded to England in September, 1956, on a Colombo Plan Scholarship. He will be away for two years on a post-graduate course at Cambridge University.

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

Mr. C. Amaracone, Laboratory Assistant, continued his experimental work at Nivitigalakele Estate.

The field experiments at Dartonfield and Hedigalla Estates were supervised by two Field Assistants and a trained field sub-staff. The staff at Dartonfield Estate also carried out the work in connection with field experiments on 9 outside commercial estates.

Advisory Work:

The major proportion of the advisory work has been concentrated on new planting and replanting programmes connected with rubber planting under the Government Replanting Subsidy Scheme and land allocations in Colonisation Schemes under the direction of the Land Commissioner. This work has been appreciably minimised by the circulars sent out by the Smallholdings and Rubber Controller's Departments. A substantial contribution has been made by the Botanist to the initial preparation of advisory leaflets and informatory publications issued by these departments.

The correspondence does not fully indicate the advisory services of the Botany Department, which have greatly increased in recent years due to an increasing number of visitors from overseas, and from this country, who come to Dartonfield in search of the latest information on Rubber planting.

Inward correspondence	...	251
Outward correspondence	...	229

Visits:

To Estates	...	...	10
To Experimental Stations	...	...	61
To P.A. meetings	...	...	4
To Colombo	...	...	8

The visits to Colombo were made in connection with the Royal Agricultural and Food Exhibition and importation of budwood from outside countries.

Leave:

The Botanist was due for end of contract leave on 1st November, 1956. The commencement of this leave was postponed to mid January, 1957, to enable the Botanist to complete his Annual Report for 1956 before his departure.

The following local leave was taken during the year under review:—

Casual	17 days
Vacation	12 „

Publications and Reports:

- (1) An article on Budwood Nurseries was prepared for publication in the Combined First and Second Quarterly Circular Publications for 1956.
- (2) The writer prepared the Annual Report for 1955 in his capacity as Acting Director from October, 1955, to January, 1956.
- (3) Notes on Budgrafting Procedure were prepared, as an Advisory Circular No. 58.
- (4) A short circular on leguminous covers was prepared for the Government Replanting Subsidy Scheme.
- (5) A Five-Year-Plan for the Botany Department was submitted to the Director in connection with the proposed expansion of the work of the Rubber Research Institute.

Breeding and Selection Work:

The first organised hand-pollination programme was carried out in 1939 under the supervision of a Geneticist, and this work was continued each year during the flowering season up to the year 1945; except 1942, when the yearly programme was suspended owing to an acute shortage of staff during the war period.

The early crosses carried out with high yielding clones in search of improved high yielding progeny were of an exploratory nature, and enabled the Geneticist to study the general technique of pollination work and the seed setting qualities of clonal seed parents.

In a large scale pollination programme undertaken in 1945 the seed set was greatly improved and 5,233 hand-pollinated seedlings were established in our nurseries.

Since 1941 a total of 5,582 hand-pollinated seedlings have been planted on the Institute's Estates, and 1,100 H.P. seedlings on commercial estates. About 3,000 clones established from a selection of these H.P. seedlings were planted at the same time.

With the resignation of the Geneticist in 1945, the supervision, test-tapping and general observations of these areas have been organised by the Botany Department from 1946 onwards. The test tapping on a per tree basis twice per month has been reduced to a minimum, by selecting only most promising material of the families of hand-pollinated seedlings, and five-tree clones which are of practical importance to the rubber planting industry. This work entailed the test-tapping of 6,521 budded and seedling trees during the year under review on a per tree basis.

The yield results of selected material which are presented in the most concise form in Tables 1 to X A indicate the desirable seedling families for commercial use, as well as the most promising clones, which have been established from the hand-pollinated seedlings. These new local clones have been designated as RRIC clones. Clonal seeds of some of the clones represented in the tables could be obtained from contact belts of the relevant clonal blocks on commercial estates. These can be advantageously used as mixed clonal seed. Seed of clone PB 86 crossed with desirable seed parents are quite promising, but in most cases PB 86 seed collected from large monoclonal blocks have been planted in this country and have given poor results.

TABLE I

**Results of 1939 H.P. Seedling Crosses, 1941 Clearing, 7½ Acres
Nivitigalakele, Tapped S/2, d/2, 100% from 1947.**

Seedling Parentage	No. of trees tapped 1956	Yield in lbs. d.r. per tree per year					B.B. cases	Bark Rot & Canker cases	Wind damage cases
		1952	1953	1954	1955	1956			
RRIC 8 × Mil 3/2	46—43	12.2	14.2	16.5	12.6	15.1	13	2	1
RRIC 8 × Pil A 44	37—34	9.0	10.1	11.6	10.9	11.2	8	—	—
Pil A 44 × Wag 6278	17	8.1	10.9	10.6	9.6	12.0	1	—	—
RRIC 8 × Wag 6278	39—37	16.6	19.9	21.5	20.5	22.2	9	—	2
Pil A 44 × RRIC 8	15—14	6.8	7.3	8.1	7.3	7.5	5	—	—
Control Wag 6278 (budded)	40—39	9.0	11.3	14.1	13.6	12.9	3	—	1

TABLE II

**Results of the 1940 H.P. Seedling Crosses, 1942 Clearing,
4 ⅔ Acres Nivitigalakele.
Tapped S/2, d/2, 100% from 1949.**

Seedling Parentage	No. of trees tapped 1956	Yield in lbs. d.r. per tree per year					B.B. cases	Bark Rot & Canker cases	Wind damage cases
		1952	1953	1954	1955	1956			
RRIC 8 × Hil 28	69—67	7.1	8.5	10.2	10.6	12.2	8	—	1
RRIC 8 × Tjir 1	62—60	10.0	13.2	14.0	14.9	18.6	17	—	5
AVROS 185 (illeg.)	19—18	8.4	10.6	11.9	12.7	13.2	3	1	1
Control Wag 6278 (budded)	63—61	12.9	9.8	13.1	13.9	14.8	5	3	5
Boundary trees									
RRIC 8 × Hil 28	58—57	6.6	8.9	9.9	10.9	13.3	11	—	2
RRIC 8 × Tjir 1	26—23	9.7	13.8	13.5	14.7	17.6	4	1	8

TABLE III

Results of Selected Five-Tree-Clones established from 1939
H.P. Seedlings, 1941 Clearing, Nivitigalakele.

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

Clone	Parentage of seedling mother tree	No. of trees tapped	Yield in lb. d.r. per tree per year					Control clone Wag 6278	B.B. cases	Bark Rot & Canker cases	Wind damage cases
			1952	1953	1954	1955	1956				
RRIC 9	RRIC 8 × Mil 3/2	4	15.7	13.0	19.6	22.6	19.1	9.6	1	—	—
" 22	RRIC 8 × Wag 6278	2	12.0	16.2	19.2	22.1	28.5	11.1	1	—	2
" 13	RRIC 8 × Mil 3/2	3	14.2	12.8	17.8	21.3	17.2	10.2	2	—	—
" 24*	RRIC 8 × Mil 3/2	5	11.9	14.5	16.5	21.1	16.3	7.9	—	—	—
" 16	RRIC 8 × Mil 3/2	5-4	15.5	17.0	18.9	19.7	19.1	9.8	2	—	—
" 17	RRIC 8 × Mil 3/2	4-3	14.9	17.5	16.6	18.0	17.0	18.8	2	1	1
" 12	RRIC 8 × Mil 3/2	5-4	14.3	15.1	16.5	18.4	13.6	9.7	1	—	—
" 19	RRIC 8 × Mil 3/2	4	13.8	15.9	20.1	18.0	18.0	13.9	1	—	1
" 51	RRIC 8 × Mil 3/2	4	14.6	17.2	19.2	15.1	20.1	8.6	1	—	—
" 21*	RRIC 8 × Mil 3/2	5	12.5	16.1	14.0	15.9	11.2	13.6	2	1	—
" 10	Mil 3/2 × Wag 6278	5-4	14.8	14.9	13.4	15.1	15.2	12.6	1	—	—
" 20	RRIC 8 × Mil 3/2	5	13.5	14.1	15.5	14.1	15.3	8.5	2	—	—
" 23*	RRIC 8 × Wag 6278	5	12.0	15.6	15.1	14.4	15.8	9.2	—	—	—
" 25	RRIC 8 × Mil 3/2	5	10.8	13.9	12.9	14.0	13.4	11.6	—	—	—
" 18	RRIC 8 × Mil 3/2	5-3	13.2	12.6	14.6	13.2	14.4	12.4	3	—	—
" 26	RRIC 8 × Pil A 44	5	10.8	10.7	13.9	13.3	14.9	10.2	—	—	—
" 14	RRIC 8 × Wag 6278	5	13.2	17.1	18.0	12.1	17.3	10.5	1	—	—
" 27*	Pil A 44 × Wag 6278	4-3	10.9	9.2	14.9	12.0	12.0	7.5	1	—	—
" 11*	Pil A 44 × Wag 6278	5	14.6	12.7	16.2	11.0	12.1	13.4	—	—	—

* Susceptible to Phytophthora leaf-fall.

TABLE IV

Results of selected Three-Tree-Clones established from
1940 H.P. Seedlings.

1944 Clearing, 4½ Acres, Nivitigalakele.

Tapped S/2, d/2, 100% from 1951.

Clone	Parentage of seedling mother tree	No. of trees tapped	Yield in lb. d.r. per tree per year					Control clone Wag 6278	B.B. cases	Bark Rot & Canker cases	Wind damage cases
			1956	1952	1953	1954	1955					1956
RRIC 45	RRIC 8 × Tjir 1	3—2	14.7	20.3	24.3	37.3	39.6	17.4	—	1	—
" 41	" × "	2	12.6	16.2	33.2	37.3	33.8	13.4	2	—	—
" 42	" × "	1	11.1	14.9	24.7	27.1	25.3	12.6	1	1	—
" 31	" × "	3	10.0	13.6	21.9	25.7	24.7	14.8	—	—	—
" 28	" × Hil 28	1	14.9	15.2	32.0	25.1	37.1	14.0	1	—	2
" 40	" × "	3	11.9	15.1	17.9	24.7	21.9	9.9	—	—	—
" 29	" × "	2	10.5	15.5	20.4	24.6	17.7	20.8	—	1	1
" 39	" × Tjir 1	2	11.0	14.8	24.8	23.2	27.7	14.2	—	—	1
" 59	" × Hil 28	3	10.9	15.6	17.7	21.2	20.4	20.0	—	—	—
" 44	" × "	3	11.9	15.1	19.9	18.4	16.6	17.0	—	—	—
" 30	" × Tjir 1	2	10.5	14.4	20.2	17.3	19.4	13.3	—	1	—
" 43	III. AVROS 185	2	10.0	10.1	17.7	14.9	16.9	12.6	1	—	1
" 60	RRIC 8 × Hil 28	3	—	—	—	—	24.6	11.6	—	—	—

TABLE V

Results of 1941 Hand Pollinated Seedling Crosses, 1943 Clearing
4 $\frac{5}{8}$ Acres Hedigalla.

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

Seedling Parentage	No. of trees tapped 1956	Yield in lb. d.r. per tree per year				B.B. cases	Bark Rot & Canker cases	Wind damage cases
		1953	1954	1955	1956			
RRIC 8 × Diy 1 ...	60	8.4	11.9	14.7	17.2	—	—	—
RRIC 8 × Tjir 16 ...	14	9.9	12.4	16.3	15.8	1	—	—
Diy 1 × Mil 3/2 ...	15	7.6	11.0	10.1	15.1	1	—	—
Tjir 1 × PB 86 } PB 86 × Tjir 1 }	25	9.4	11.2	12.8	14.9	—	3	—
PB 86 × M. 162 ...	14	9.2	12.3	16.8	17.7	—	—	—
PB 86 × PR 107 ...	22	13.2	18.8	19.0	21.2	1	4	—
M 3 (RR 9) × RRIC 8 ...	11	6.0	9.7	11.4	13.7	2	—	—
TKD 113 × RRIC 8 ...	13	—	13.7	16.5	18.6	—	—	—
Control Wag 6278 (budded)	24	6.7	12.8	11.2	12.6	—	—	—

TABLE VI

Results of selected clones established from 1941 H.P. Seedlings.

1943 Clearing, 14 Acres, Hedigalla.

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

Clone	Parentage of Seedling Mother Tree	No. of trees tapped 1956	Yield in lbs d.r. per tree per year				B.B. cases	Bark Rot & Canker cases	Wind damage cases
			1953	1954	1955	1956			
RRIC 75	RRIC 8 × Tjir 16	4	12.3	23.0	30.5	37.6	—	—	1
37	RRIC 8 × Diy 1	4	15.2	21.7	29.5	18.7	—	—	—
47	Diy 1 × Mil 3/2	4	14.5	21.8	26.7	26.9	—	—	—
46	PB 86 × PR 107	3	13.5	23.3	25.6	23.0	—	—	—
33	RRIC 8 × Dal 5315	5	14.0	21.3	24.3	23.8	1	—	—
76	TKD 113 × RRIC 8	4	—	18.3	21.5	26.4	—	—	—
50	Tjir 1 × PB 86	4	12.6	18.6	21.0	22.9	—	—	—
74	PB 86 × PR 107	5	10.1	18.6	20.7	19.3	—	1	—
36	PB 86 × PR 107	4	18.5	29.0	20.6	29.8	—	—	—
38	PB 86 × PR 107	5	10.6	20.3	17.0	17.6	—	—	—
35	PB 86 × Tjir 1	5	11.7	18.0	16.2	20.3	—	—	—
32	RRIC 8 × H 24	5	10.4	13.5	15.5	17.2	—	—	—
79	PB 86 × M 162	5	13.2	16.4	20.4	22.3	—	—	—
	Wag 6278 (Control clone)	254				16.5			

TABLE VII

Results of 1943 H.P. Seedlings, 1946 clearing, Hedigalla.

Tapped S/2, d/3, 67% from 1953 to 1955.

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

Seedling Parentage			No. of trees tapped 1956	Yield in lbs d.r. per tree per year			B.B. cases	Wind damage cases
				1954	1955	1956		
PB 86	×	Tjir 1 ...	14	4.8	5.6	8.0	—	—
"	×	Mil 3/2 ...	9	5.6	6.0	10.7	—	—
"	×	RRIC 8 ...	53	5.8	6.7	11.9	1	11
"	×	Wag 6278 ...	17	7.5	8.7	15.8	1	1
Tjir 1 Budded Control		...	67	4.9	5.7	11.5	3	12

TABLE VIII

Results of clones established from 1943 H.P. Seedlings.

1946 Clearing, 12 $\frac{3}{4}$ Acres, Hedigalla.

Tapped S/2, d/3, 67% from 1953 to 1955.

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

Clone	Parentage of Seedling Mother Tree	No. of trees tapped	Yield in lbs d.r. per tree per year		
			1954	1955	1956
RRIC 55	PB 86 × Wag 6278	5	12.5	16.5	22.4
" 54	" × "	5	9.3	12.8	20.9
" 62	" × RRIC 8	5	8.0	10.7	12.1
" 77	" × "	5	7.6	10.4	16.1
" 57	" × "	5	8.1	10.3	14.7
" 61	" × "	4	9.6	10.1	17.0
No. 279	" × Wag 6278	5	7.9	9.9	15.9
" 301	" × Mil 3/2	4	6.7	9.8	16.9
" 258	" × RRIC 8	5	7.7	9.2	13.2
" 241	" × "	5	6.3	8.9	14.9
" 299	" × Mil 3/2	5	7.8	8.8	14.7
" 268	" × Wag 6278	5	6.6	8.3	16.6
" 260	" × RRIC 8	5	7.6	8.0	14.2
" 233	" × "	5	5.8	8.0	13.0
" 229	" × "	5	6.5	7.8	13.0
Control Clone Tjir 1			4.9	5.2	9.4

TABLE IX

**Results of the 1944 Hand-Pollinated Seedlings,
1946 Clearing, Hedigalla.**

Tapped S/2, d/3, 67%, 1953—1955.

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

Seedling Parentage	No. of trees tapped 1956	Yield in lb. d.r. per tree per year				B.B. cases	Bark Rot & Canker cases	Wind damage cases
		1953	1954	1955	1956			
PB 5/139 × TKD 113	152	5.2	8.1	8.4	13.6	4	1	1
PB 86 × TKD 113	145	3.2	5.3	6.8	12.3	2	—	1
” × Glen 1								
” × BR 2								
” × Mil 3/2								
” × Dal 5315								
” × BD 10								
” × Pil B 84								
” × PB 5/60								
” × Wag 6278								
” × PB 5/139								
” × Hil 28								
” × AVROS 163								
” × PB 6/50								
” × Tjir 1								
TKD 113 × Tjir 1	43	4.1	7.5	9.1	14.1	1	—	5
” × RRIC 5								
” × Glen 1								
” × Hil 28								

TABLE X

**Results of clones established from 1944 Hand-Pollinated Seedlings,
1947 Clearing, Hedigalla.**

Tapped S/2, d/3, 67% from June, 1954.

Clone	Parentage of Seedling Mother Tree	No. of trees tapped	Yield in lbs d.r. per tree per year	
			1955	1956
RRIC 64	PB 5/139 × TKD 113	5	15.0	22.6
RRIC 78	” × ”	5	11.3	23.0
RRIC 65	” × ”	5	8.6	15.2
RRIC 63	” × ”	5	8.4	10.9
RRIC 66	” × ”	5	5.8	13.9
No. 109	” × ”	5	8.0	14.8
No. 17	” × ”	5	7.6	14.9
No. 293	PB 86 × PB 5/60	5	7.2	13.2
No. 256	” × Mil 3/2	4	5.4	13.8
No. 135	PB 5/139 × TKD 113	5	5.7	13.7
No. 134	” × ”	5	5.6	13.3
No. 56	” × ”	5	6.9	13.1
No. 33	” × ”	5	6.8	12.8
No. 28	” × ”	5	6.6	13.3
No. 136	” × ”	5	5.9	13.8

TABLE X A

Results of the 1945 H.P. Seedlings, 1947 Clearing, Hedigalla.
Yield in lbs. per tree per year, Tapped S/2, d/3, 67%.

Seedling Parentage		No. of trees tapped 1956	Yield		
			1954 lb.	1955 lb.	1956 lb.
AV 157	× AV 352	4	—	1.3	3.8
AV 163	× AV 255	389	1.9	3.1	4.4
"	× BR 2				
"	× RRIM 519				
"	× RRIM 506				
"	× Tjir 1				
"	× RRIM 514	187	—	3.5	5.7
RRIM 514	× AV 163				
BR 2	× Tjir 1				
"	× AV 255				
"	× RRIM 506				
"	× RRIM 514	3	—	2.0	4.5
RRIM 514	× BR 2				
Selfed AV 163					
PB 5/139	× RRIM 500				
"	× RRIM 501				
"	× RRIM 504	546	3.0	5.2	7.8
"	× RRIM 506				
"	× RRIM 511				
"	× RRIM 513				
"	× RRIM 518				
"	× RRIM 519				
"	× RRIM 520				
"	× BR 2				
"	× KD 2				
"	× BD 10				
"	× PB 6/50				
"	× PB 5/139				
RRIM 506	× "					655	2.8	4.5	7.1
RRIM 514	× "				
PB 86	× AV 163				
"	× RRIM 519				
"	× RRIC 4				
"	× RRIC 5				
"	× RRIC 6				
"	× RRIC 7				
"	× AV 255				
"	× AV 352				
"	× AV 157				
"	× PB 23				
"	× RRIC 2				
"	× PB 86				
Tjir 1	× RRIM 514	253	2.0	3.4	5.6
"	× RRIM 506				
"	× AV 255				
PB 86 Supplies (illeg.)		538	1.8	3.0	4.8
Tjir 1 Supplies (illeg. and selfed)		236	—	2.1	3.8
Glen 1 Supplies (illeg.)		41	—	1.8	3.1
Mean		(2,852 trees)		3.8	5.9

Hand-Pollination Programmes from 1950 to 1956:

Hand pollination programmes were carried out from 1953 to 1956 under the general supervision of the Botanist. The work was entrusted to the Assistant Plant Breeder, especially appointed for this work in 1953.

The pollination work was introduced as a second stage of the breeding work in collaboration with the then Mycologist, using clone LCB 870, which is resistant to *Oidium heveae*, for crossing with high yielding clones, especially clone PB 86, and from 1950 to 1952 was supervised by the Mycologist.

Clone LCB 870, although resistant to *Oidium heveae*, is now known to be susceptible to *Phytophthora* leaf fall. The clone is also an extremely poor yielder with thin bark. The results of the test tapping of 67 trees planted on a commercial estate were as follows:—

Yield of clone LCB 870 from Jan. to Dec., 1956.

Planted 1947. 2nd year of test tapping. Tapped S/2, d/2, 100%

Total yield of dry rubber from Jan. to Dec. '56	4082.9 gms.
Total number of tappings	716
Yield in gms/tree/tapping	5.7
Yield in lbs. per tree per year	1.76

The poor yielding qualities of clone LCB 870 are now amply confirmed from the data presented for 1956, and from the yield results recorded in earlier reports. The yields of the earliest crosses made with clone PB 86, as can be expected, are not high yielding. The chances of selecting a cross, which is both high yielding and resistant to *Oidium heveae* are rather poor. Clone LCB 870 has been eliminated from future pollination programmes.

Together with this preliminary work of breeding for disease, the RRIC clones No. 9, 10, 36, 38, 39, 41, 42, 50 and 51 have been used for crosses representing "sibs", "half sibs" and back crosses. The seed set has been generally poor due to the more specific crosses involved, but a fair amount of material has been established in our nurseries and experimental areas for a preliminary study of these specific crosses and derived five-tree-clones.

Breeding for Resistance to Disease:

Twenty-five Latin American clones of the F and FX series were obtained from the R.R.I. of Malaya in 1955. These clones are resistant to *Dothidella ulei* (South American leaf disease) and some of them to *Phytophthora*. An organised programme for breeding work will be initiated, as soon as the material is sufficiently developed for flowering. For this purpose, 4-year-old trees of clone PR 107 have been crown budded with the F and FX clones in December, 1956, in a 4 acre clearing on Hedigalla Estate. Apart from the pollination work in view, observations will be made on the incidence of *Oidium heveae*, and the effect of the crowns on the yield of the budded centre sections of clone PR 107.

One of these clones F 4542, which is a *Hevea benthamiana* clone, is resistant to both *Dothidella ulei* and *Phytophthora* diseases. If this clone is found resistant to *Oidium heveae*, it will be an ideal clone for crown-budding in place of clone LCB 870. Clone F 4542 will also be used for interspecific crosses with high yielding clones of *Hevea brasiliensis*.

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

Field trials in connection with the selection of foreign clones for large scale commercial planting commenced as early as 1935. Most of the earlier selected clones have been eliminated from our planting programmes. The better known clones have been tested from 1939 onwards; several of these clones have been recommended for commercial planting in recent years. The results are presented in Tables XI to XVII.

'Nab' Clones:

Twenty-one Nab clones were established from selected high yielding Tjikadoe seedlings on Nabunnatenne Estate in 1939. The testing of 4 of these clones has been continued with clone PB 86 as a control. The Nab clones are most vigorous growers and compare very favourably with the performance of clone PB 86. Clones Nab 12, 15 and 20 are comparatively less susceptible to Phytophthora diseases than clone PB 86. The results are presented in Table XI.

TABLE XI

1939 Clearing, Field 5, 10½ acres, Nivitigalakele
Trees first tapped in 1945.
Tapping system S/2, d/2, 100%

Clone	No. of trees tapped	Yield in lb d.r. per tree per year					B.B. cases	Bark Rot & Canker cases	Wind damage cases
		1956	1952	1953	1954	1955				1956
Nab 12	19—18	17.4	16.9	18.0	20.8	15.9	5	—	1
Nab 15	17—16	13.6	14.7	16.5	14.3	15.7	4	1	—
Nab 17	19—18	15.6	16.0	17.1	16.2	16.7	10	—	2
Nab 20	12—9	18.4	15.6	16.3	18.9	16.2	7	—	7
Controls									
PB 86	19	17.3	17.6	18.3	19.6	17.3	3	—	—
Wag 6278	18—16	8.5	11.0	12.1	9.5	11.4	3	—	3
Mil 3/2	18—16	12.5	12.3	12.6	15.3	13.6	8	—	1

TABLE XII

1941 Replanted Area, 2 acres, Dartonfield.
Tapped S/2, d/2, 100% 1948.
Yield in lbs. d.r. per tree, per year.

Planting Material		Clone RRIM 501	Mixed Clonal Seedlings
No. of trees tapped	...	92	96
Yield:—1953	...	17.1	11.3
1954	...	17.4	11.3
1955	...	14.7	10.3
1956	...	16.9	11.4
B.B. cases (1956)	...	18	16
Bark Rot and Canker cases 1956	...	38	22

TABLE XIII

Clone Trial, Field 6, 1940 Clearing, 9 $\frac{1}{4}$ Acres, Nivitigalakele.

Tapped S/2, d/2, 100%

First Tapped in January, 1947.

Clone	No. of trees tapped	Yield in lb d.r. per tree per year					B.B. cases	Bark Rot & Canker cases	Wind damage cases
		1956	1952	1953	1954	1955				1956
RRIM 501	... 18—17	13.9	14.7	15.6	17.3	12.6	7	—	6
PB 6/50	... 21	9.3	9.8	13.8	15.1	16.0	6	—	2
*AVROS 352	... 12—10	11.3	12.0	18.0	14.7	13.7	9	1	6
*PR 107	... 22—21	11.6	11.2	14.1	14.3	14.3	3	2	2
*RRIM 513	... 23—22	11.1	10.1	11.1	14.3	10.6	4	—	—
AVROS 255	... 17—16	15.1	12.8	19.8	13.9	19.4	8	—	6
War 4	... 24—23	11.0	10.7	12.1	13.3	14.9	4	1	—
RRIC 1	... 22—21	12.3	11.1	13.9	12.1	13.4	3	—	—
Lun N	... 20—18	10.5	11.7	13.4	11.0	13.5	5	—	2
Controls									
Tjir 1	... 20—19	7.7	13.6	13.0	12.2	16.1	7	—	2
*Wag 6278	... 22—21	9.7	10.6	13.1	10.6	13.8	—	—	3

* Phytophthora leaf-fall

TABLE XIV

1946 Large scale Clone Trial, 1946 Clearing, 21 $\frac{1}{4}$ Acres Nivitigalakele

Trees tapped S/2, d/3, 67% from 1953 to 1955.

Trees tapped S/2, d/2, 100% from January, 1956.

Yield in lbs. d.r. 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
" 1956	13.7	8.7	12.6	14.6	12.4	13.5	9.7	9.8
No of trees tapped	279-305	240-281	279-300	297-309	290-302	276-290	246-269	289-295
Brown Bast cases	10	4	11	5	5	9	9	2
Bark Rot and Canker cases	—	4	3	1	—	—	—	17*
Wind damage cases	34	64	9	13	17	38	34	9

* Bark Rot cases

The yields of clones RRIM 501, AVROS 255, LCB 1320, PR 107 and PB 5/60 are reassuring. These clones have been included in the planting material recommended for commercial planting in 1955. Clone PR 107 is very susceptible to Phytophthora bark diseases, and should only be planted in the drier rubber growing districts.

Clone RRIC 52:

This clone is of particular interest, as it has turned out to be a most vigorous grower, with good bark characteristics and moderately high yielding capacity. It starts a partial wintering about the 10th year, and is definitely shade tolerant. It has a spreading branching system, with a luxuriant spread of foliage to within 8 feet of ground level. The original nomenclature of the clone was RR 28. It was established from a Tjidadoe Seedling (TKD 103) in 1944, and was first tapped in 1951. In 1956 the yields are very promising, partly due to its outstanding girth and length of tapping cut. The results are presented in Table XV.

The clone has similar characteristics to clone LCB 1320 in that it has a partial wintering habit, and is comparatively resistant to Phytophthora diseases.

TABLE XV

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

Clone	No. of trees tapped 1956	Yield				B.B. cases	Bark Rot & Canker cases	Wind damage cases
		1953	1954	1955	1956			
No. 25 ...	4	9.5	13.9	16.9	19.8	—	—	1
PB 5/122 ...	5	7.6	14.9	13.8	18.7	—	—	—
RRIC 52 ...	4	8.3	13.1	12.7	17.7*	—	—	—
PB 6/5 ...	4	9.1	13.1	13.1	18.0	—	—	1
Wag 6278 Control ...	4	6.3	11.8	9.4	11.8	—	1	—

* Tapped from January to June, 1956.

Unfortunately, due to an oversight, the clone RRIC 52 was only test tapped from January to June, 1956. The yield of 17.7 lbs. dry rubber per tree per year, for the poorer yielding half of the year is, however, very promising. In order to compensate for the loss of information, 3 test-tappings of the 4 trees of clone RRIC 52 was carried out in December, 1956, under the personal supervision of the Botanist. The girth and bark measurements were also taken during the same period; the results are given in Table XVI.

TABLE XVI

Test tapping of clone RRIC 52 in December, 1956.
Tapped S/2, d/2, 100% from 1951.

Tree No.	Yield in gms. dry rubber per tree per tapping			Girth in inches	Bark thickness in millimetres	
	1st tapping	2nd tapping	3rd tapping		Virgin bark	5 years renewed bark
No. 9 ...	124.6	105.5	149.8	46.2	11.0	8.5
No. 33 ...	100.2	78.7	95.5	45.1	10.0	8.0
No. 52 ...	141.9	107.0	139.8	42.3	10.0	8.5
No. 88 ...	57.7	67.2	92.2	45.4	10.0	7.5
Mean ...	106.1	89.6	119.3	44.8	10.2	8.1
G. Mean ...	105 gms. per tree per tapping					

The average yield for the three tappings in December, 1956 works out to 32.4 lbs. dry rubber per tree, per year. If this figure is taken as an approximate average for the standard of yields in the second half year, the 4 trees will have an average of 25 lbs. of dry rubber per tree per year, for 1956.

Clone RRIC 52 with its vigorous growth and girth of 44.8 inches at approximately 12 years of age can give good yields in the 5th tapping year, although it is inherently a moderately high yielding tree. The clone is worth a trial on a small scale on most estates. Because of its spreading branches, a spacing of 12' x 20' is recommended for contour planting.

Clones RRIC 2 to 7:

Clones RRIC 2 to 7 are the primary selections from 120 three-tree-clones established from PBIG seedlings imported in 1934. In a second trial 75 trees of each of these clones are tapped in the 1945 clearing at Hedigalla. The results are given in Table XVII.

TABLE XVII

Results of clone RRIC 2 to 7, 1945 Clearing, 10½ Acres, Hedigalla.

Tapped S/2, d/3, 67% from 1953 to 1955.

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

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

Clone		RRIC 2	RRIC 3	RRIC 4	RRIC 5	RRIC 6	RRIC 7	Control Tjir 1
Yield	1954 ...	6.3	4.8	7.4	8.2	6.5	6.8	5.0
	„ 1955 ...	7.0	5.6	8.3	10.3	8.6	9.1	8.3
	„ 1956 ...	11.1	8.5	10.4	13.1	12.1	13.9	11.0
Bark Rot cases	...	—	—	—	—	1	—	—
W.D. cases	...	—	1	2	—	—	1	3

Clones RRIC 5, 6 and 7 are very promising, with good secondary characters. These three clones should find a place in any small scale clone trial of the RRIC clones on commercial estates.

Crown Budding Experiments:

The use of the low yielding Oidium-resistant clone LCB 870 for crown budding rubber planted above an elevation of 800 feet called for investigations on the effect of the low yielding crown on the tapped area on clonal seedlings and budded rubber.

The first trial was started in 1948, when approximately two-year-old twin pairs of seedlings were crown budded with a high yielding clone Tjir 1 and clone LCB 870. Twin-seedlings pairs have been proved to be of equal yielding capacity under equal conditions of growth. This material is ideal for comparing the effects, if any, of the two crowns on the yield of the tapped area.

The yields of the second tapping year are given in Table XVIII.

TABLE XVIII

1948 Crown Budding Experiment with Twin Seedlings, Hedigalla.

Material	No of Twin Pairs	Yield in grams per tree per tapping	
		Tjir 1 crown	LCB 870 crown
Tjir 1 Seedlings ...	39	22.6	20.4
PB 86 ,, ...	38	22.1	19.0
Glen 1 ,, ...	25	22.9	18.1
Mil 3/2 ,, ...	50	24.6	20.3
Unselected ,, ...	28	12.7	13.9
Mean ...		21.0	18.3

The figures have not been statistically analysed for this report, but they suggest that the crown of clone Tjir 1 has resulted in a better yield of the centre pieces than the crown of clone LCB 870, despite the fact that the latter is resistant to *Oidium* and the former is very susceptible.

Large Scale Crown Budding Experiment, 1945 Clearing, 11½ Acres, Hedigalla:

Clones Tjir 1, AVROS 256, PB 86, PM 17, Glen 1 and Rubana 393 are used both as budded centre sections and crowns in this experiment. The growth and yield figures for 1956 are given in Tables XIX A and XIX B.

Clones Tjir 1, PB 86 and Glen 1 are high yielding clones, clone Rub 393 is moderately high yielding, and clones PM 17 and AVROS 256 are poor yielding. The control figures for any comparison are printed in bold type.

TABLE XIX A

**1945 Clearing—Hedigalla Crown Budding Experiment
Yields in gms./tree/tapping.**

Centre Section	Height of budding	CROWN						Mean
		Tjir 1	AVROS 256	PB 86	PM 17	Glen 1	Rub 393	
Tjir 1	5'	27.4	22.9	29.4	19.2	22.1	21.4	23.7
	8'	30.1	24.3	31.1	18.0	23.4	19.2	24.3
AVROS 256	5'	24.6	16.3	33.5	17.5	19.0	20.8	21.9
	8'	22.6	15.6	33.8	15.7	21.2	20.8	21.6
PB 86	5'	29.0	30.8	32.8	16.8	25.1	23.9	26.4
	8'	29.2	29.0	32.6	19.5	29.2	23.6	27.2
PM 17	5'	24.2	26.2	35.8	19.1	23.8	23.6	25.4
	8'	27.4	25.6	37.2	19.3	23.8	21.8	25.9
Glen 1	5'	38.9	29.2	35.2	24.3	30.5	30.4	31.4
	5'	30.1	30.6	34.5	22.2	30.7	31.0	29.9
Rub 393	5'	25.9	23.7	25.2	15.4	17.1	22.7	21.7
	8'	23.3	23.7	21.4	15.6	22.3	20.7	21.2
Mean	5'	28.3	24.8	32.0	18.7	23.0	23.8	25.1
	8'	27.1	24.8	31.8	18.4	25.1	22.9	25.1
General Mean	...	27.7	24.8	31.9	18.5	24.0	23.3	25.1

TABLE XIX B

Girth in inches

Centre Section	Height of budding	CROWN							Mean
		Tjir 1	AVROS 256	PB 86	PM 17	Glen 1	Rub 393		
Tjir 1	5'	23.0	25.6	26.1	22.8	24.8	23.9	24.3	
	8'	23.8	25.8	25.3	21.6	23.4	22.8	23.8	
AVROS 256	5'	23.5	26.1	26.6	22.9	23.2	23.1	24.2	
	8'	24.7	25.8	26.6	22.9	24.6	25.4	25.0	
PB 86	5'	23.4	25.3	24.5	22.2	23.2	23.2	23.6	
	8'	24.8	25.3	24.8	21.6	25.0	23.1	24.1	
PM 17	5'	24.2	27.5	27.7	22.6	24.0	26.0	25.3	
	8'	24.8	25.4	25.8	21.8	23.5	23.3	24.1	
Glen 1	5'	26.8	25.8	24.9	22.0	23.3	23.3	24.3	
	8'	22.6	25.4	25.1	21.2	23.1	23.8	23.5	
Rub 393	5'	25.8	28.9	26.1	22.3	25.1	26.5	25.8	
	8'	25.8	26.5	25.3	22.3	23.7	25.0	24.8	
Mean	5'	24.4	26.5	26.0	22.4	23.9	24.3	24.6	
	8'	24.4	25.7	25.5	21.9	23.9	23.9	24.2	
General Mean	...	24.4	26.1	25.7	21.2	23.9	24.1	24.4	

Clone PM 17, with its sparse foliage and poor yielding characteristics, has given the poorest results for growth and yield, when it is used for crown budding.

Clone PB 86 as a crown has given good results for both growth and yield. In this trial clone PB 86 has been free of Phytophthora leaf fall, which could of course adversely affect its vigour of growth and its yield.

Clone Tjir 1 has also given good results, without any Oidium leaf disease.

In general, it would appear that the vigour of growth and the density of foliage of the crown is the important factor for good growth and yield of the budded centre-sections, according to the inherent qualities for growth and yield of the budded centre-sections.

There are no differences in yield or growth when the budded trees are crown budded at 5' or 8' from ground level. This information in the second year of tapping is of considerable practical importance.

Large scale clone trial, 1952 Replanted Area, 35 Acres:

Clones Nab 12, 15, 29, RRIM 501 and PB 86 are planted in 200-tree-plots, which are replicated fourfold in 4 blocks. One hundred trees in each of the 200-tree-plots were crown budded with clone LCB 870. This is a final trial for checking the effect of a low yielding clone LCB 870, which is crown budded on high yielding clones for the purpose of controlling Oidium leaf disease.

Girth measurements taken in August, 1954, 1955 and 1956 are summarised below:—

	Mean girth in inches	
	Trees crown budded with clone LCB 870	Control trees not crown budded
Prior to crown budding, Aug, 1954 ...	6.3	6.4
One year after crown budding, Aug. 1955 ...	7.6	10.9
Two years after crown budding, Aug. 1956 ...	10.3	14.6

The crown budded trees are 4.3 inches behind the control trees, two years after crown budding. In later years, however, the LCB 870 crowns will be free of *Oidium* leaf disease. Unfortunately clone LCB 870 has been found to be susceptible to *Phytophthora* leaf disease, and its usefulness for crown budding in the wet districts is therefore limited.

The growth figures of the five clones given below are very satisfactory at 4 years of age. The growth of Clone Nab 15 is outstanding.

Clone	PB 86	RRIM 501	Nab 12	Nab 15	Nab 20	Mean
Mean girth in inches	... 13.3	14.8	13.8	16.8	14.4	14.6

MISCELLANEOUS EXPERIMENTS

Systems of Planting:

Clone Trial with Wide Avenue Planting 6' × 45', 1949 Clearing, 35 Acres, Hedigalla Estate.—This experiment with a spacing of 6' × 45' was initiated in 1949 to obtain preliminary information on the more extreme forms of "avenue" planting. The more normal systems of "avenue" planting 8' × 30', and 12' × 20' are now being adopted in most replanted areas in this country for planting budded rubber.

Thirty-one clones planted in six 25-tree-plots have been tapped in 1956, from July to November. The results are presented in Table XX.

The early yields in this Wide Avenue Planting experiment are very promising, especially for clone PB 86 and the Nab clones.

Clones RRIM 501, 513 and 504, and clone RRIC 52 have given very satisfactory preliminary yields for the first five months of tapping on this more extreme system of planting.

Planting with a spacing of 8' × 30' can now be confidently undertaken by most estates. This contour system of avenue planting has many advantages of a very practical nature, on the difficult terrain of rubber planting land in this country.

A number of estates have adopted the spacing of 6' × 40' on sizeable acreages, and the results are awaited with considerable interest. The initial stand of 180 trees per acre will be selectively thinned out to about 130 to 140 trees by the third year of tapping.

TABLE XX

1949 Wide Avenue Planting Experiment, Hedigalla Estate
Yield in gms. per tree per tapping
Tapped S/2, d/3, 67%, July to November, 1956

Clone	PB 6/50	Nab 16	PB 86	Nab 17	RRIM 513	Nab 20	No. 19	No. 49	No. 30	RRIM 504
No. of trees tapped	156	94	128	145	117	194	74	124	120	103
Yield	25.6	25.6	25.0	24.7	22.1	21.4	18.3	18.3	18.3	18.0

Clone	No. RRIM 29	No. 501	No. 32	No. 48	No. 44	No. 50	LUN N	No. 46	No. RRIC 52	DAR 38
No of trees tapped	107	104	88	118	102	60	96	119	138	104
Yield	17.8	17.5	17.2	17.2	17.1	14.3	13.6	13.4	13.3	12.8

Clonal Seedling Trial, 1947 Replanted Area, 10½ Acres, Dartonfield Estate.—Four different types of clonal seedlings are test tapped in this experiment with Tjir 1 budded trees as a control.

A stand of 260 trees per acre was reduced to 160 trees per acre in 1951, on the results of early tapping on the Morris-Mann system.

The trees were taken into permanent tapping in 1952. The yield results for 1955 and 1956 are given in Table XXI.

TABLE XXI

1947 Replanted Area, Clonal Seedling Trial
Tapped S/2, d/2, 100% from 1955
Yield in lbs. per tree per year.

Planting Material	Tjir 1 Seedlings	PB 86 Illeg. Seedlings	PB 5/139 Seedlings	H.P. Seedlings	Budded Tjir 1 control
Yield 1955	8.2	6.2	8.4	10.1	8.0
„ 1956	7.4	6.2	7.6	9.1	8.0

The yields in the 5th year of tapping is approximately the same as the previous year's results. A further thinning out of the poorest yielding trees will be carried out in 1957 on the test-tapping plots as the stand per acre is still considerably above that recommended as a permanent stand in the fifth year of tapping.

The yield of the Tjir 1 seedlings is quite satisfactory compared with the control budded Tjir 1 trees.

Trials of H.P. Seedlings and Derived Five-Tree-Clones on Outside Estates.—A proportion of the 1945 hand pollinated seedlings were planted on 9 commercial estates in groups of 100 H.P. seedlings and 100 five-tree-clones established from these seedlings. A total of 1100 H.P. seedlings and 1100 clones were planted in 1947 and 1948.

The H.P. seedlings and clones have been test tapped from 1954, under the supervision of the Assistant Plant Breeding Officer and a trained itinerating field staff. The work has been greatly minimised by eliminating the poor yielding clones at an early date. The results of the H.P. seedlings and selected clones are given in tables XXII A and XXII B.

The yields of both seedlings and clones are the same as the previous year, due to a revision of the correction factor for dry rubber content of the coagulated biscuits of 40 grams and over. The greater number of tapping days in a very dry year (1956) has also depressed the yields on a per tapping basis. Nevertheless the yields of the selected five-tree clones are very promising, a few clones yielding over 20 lbs. dry rubber per tree per year, in the third tapping year, are outstanding.

TABLE XXII A

Results of 1945 H.P. Seedlings Planted on Commercial Estates
Yield in lbs. dry rubber per tree per year
Tapped S/2, d/2, 100%

FAMILY		No. of trees tapped	1954	1955	1956
Female	Male				
PB 5/139	× RRIM 520	437	9.8	11.0	10.3
"	× BR 2				
"	× RRIM 501				
"	× " 504				
"	× " 506				
"	× " 513				
"	× Tjir 1				
"	× RRIM 514				
"	× PB 6/50				
"	× BD 10				
"	× KD 1				
"	× RRIM 511				
"	× " 519				
"	× " 518				
"	× " 500				
RRIM 506	× PB 5/139	401	9.1	11.0	11.8
RRIM 514	× PB 5/139				
PB 86	× RRIC 5				
"	× RRIC 7				
"	× AVROS 255				
"	× RRIM 519				
"	× AVROS 352				
"	× AVROS 157				
"	× PB 23				
"	× AVROS 163				
"	× RRIC 4				
AVROS 163	× RRIM 519	84	—	6.0	6.3
AVROS 163	× RRIM 506				
RRIM 514	× BR 2	16	—	9.4	9.1
Total		938			
Mean yields			9.5	10.8	10.6

TABLE XXII B

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

Yield in lbs d.r. per tree per year, all clones

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

† Tapped S/2, d/3, 67%

Clone	Parentage of Mother Tree	No. of trees tapped (1956)	Yield in lb. per tree per year		
			1954	1955	1956
RRIC 73	PB 86 × RRIC 7	4	13.1†	16.0†	15.6†
No. 243	„ × AVROS 157	5	—	17.6	20.8
„ 158	„ × RRIC 7	5	—	—	13.4*†
„ 275	„ × RRIC 5	4	—	10.0†	20.2
RRIC 68	„ × RRIC 4	3	17.5	19.8	20.1
„ 69	„ × RRIC 7	5	19.3	16.7	19.7
No. 293	„ × „	5	9.8†	11.1†	12.8†
RRIC 83	PB 5/139 × RRIM 513	4	11.7†	13.1†	17.2
„ 67	„ × RRIM 511	3	12.3†	11.2†	17.2
„ 81	PB 86 × RRIC 7	5	14.8	20.9	17.0
„ 70	„ × „	3	22.9	19.5	16.5
No. 294	„ × „	5	11.3†	10.9†	10.9†
RRIC 84	„ × „	4	8.6†	12.6	16.3
„ 82	PB 5/139 × PB 6/50	4	—	20.2†	15.5
„ 71	PB 86 × RRIC 7	4	10.7†	10.8†	15.0
„ 72	„ × „	5	13.5†	10.3†	9.2†
„ 85	PB 5/139 × RRIM 500	5	—	16.5	13.1

* Tapped from June to December 1956

1956 Hand-Pollination Programme.—Results of the hand pollinations carried out were very poor due to the increasing incidence of *Phytophthora* pod rot in recent years. Without adequate control of surrounding trees with copper fungicides, the control on trees used for hand-pollination work has not been very successful.

108 seedlings were established in the nurseries of useful crosses with selected RRIC clones No. 10, 41, 45, 50, Clone Nab 12, AVROS 157, RRIM 501 and Mil 3/2.

Growth Measurements in Immature Rubber in Field Experiments.—The first series of growth measurements are taken after 2 years growth. An average girth of 5 to 6 inches at a height 3 feet from the union is considered as normal good growth at two years of age.

A rate of growth of 3 to 4 inches in girth per year is considered as good growth. Under good conditions of growth this annual increase should be maintained up to maturity, when the trees are due for tapping.

The girth measurements taken in 1956 are summarized for the following clearings and replanted areas:—

Clone Trial, 1954 Clearing, 10½ Acres, Nivitigalakele Estate.—Seven foreign clones are tested in this area with clone RRIM 501 as a control. The trees were planted in May, 1954, and girth measurements were taken in July, 1956. There are 200 trees of each clone in 40 tree plots.

Clones	IRCI 10	IRCI 7	PB T207	PB 6/5	PB 24/3	PB 28/59	PB 24/51	RRIM 501
Mean girth in inches	6.3	6.5	5.8	5.9	5.4	6.6	5.4	5.5

The above clones have grown extremely well in 2 years in a favourable area of virgin jungle on Nivitigalakele estate. The growth in general is above average.

1950/51 Replanted Area, 28 acres, Dartonfield Estate. Five-tree clones established from 1945 H.P. Seedlings.—The girth measurements were taken in December, 1956, when the trees were 6½ years and 5½ years of age in the 1950 and 1951 clearings respectively.

Area	Total no. of trees	Mean girth in inches		Increase
		1955	1956	1955/56
1950	2906	17.7	20.4	2.7
1951	335	12.5	16.5	4.0

This 1950 area will be brought into tapping in 1957. For experimental tapping, trees of 18 inches girth and over are tapped on a reduced intensity of 67% on S/2, d/3 tapping system, in the first three years. This procedure enables the Institute to check the comparative yield figures as early as possible.

Large Scale Clone Trial 1953 Clearing, 114¾ Acres, Hedigalla Estate.—Selected RRIC clones are tested on a large scale in this clearing, with foreign and local clones recommended for commercial planting as controls. Girth measurements were taken in May, 1956, when the trees were 3 years of age. The figures are summarized below:—

Clone	Mean girth in inches	Clone	Mean girth in inches
LCB 1320	8.8	RRIC 1	5.5
Lun N	7.6	RRIC 2	6.7
RRIM 501	7.2	RRIC 3	6.9
LCB 870	6.8	RRIC 4	6.3
Mil 3/2	6.5	RRIC 5	7.5
Tjir 1	6.3	RRIC 6	5.5
Wag 6278	6.2	RRIC 7	7.5
RRIM 513	7.2		

The virgin land on Hedigalla Estate is generally poorer in soil conditions than replanted land on commercial estates. The growth is below average good growth. Similar results were obtained on virgin land on Nivitigalakele Estate 20 years ago for trees of the same age. In most areas the growth improves considerably after the 4th year. Manuring has been carried out systematically each year according to recommendations.

Large Scale Clone Trial, 1954 Clearing, 148 Acres, Hedigalla Estate.—Approximately 5 acres each of clones RRIC 16 to 37 are planted in this area, with clones RRIM 501, PB 86, and IRCI 10 as controls.

The girth measurements were taken from July to September, 1956; a summary is given below:—

Clone	RRIC 31	RRIC 35	RRIC 18	RRIC 22	RRIC 23	RRIC 34	RRIC 36	RRIC 24	RRIC 16	RRIC 28
Mean girth in inches ...	5.4	4.8	4.7	4.6	4.4	4.4	4.3	4.3	4.1	4.1

Clone	RRIC 26	RRIC 32	RRIC 17	RRIM 501	RRIC 19	RRIC 37	IRCI 10	RRIC 29	RRIC 21
Mean girth in inches ...	4.1	4.1	4.0	4.0	3.8	3.8	3.8	3.7	3.7

Clone	RRIC 33	RRIC 25	RRIC 27	PB 86	PR 107	RRIC 20	RRIC 30	AVROS 1301
Mean girth in inches ...	3.6	3.5	3.5	3.3	3.3	3.2	2.9	2.4

G. Mean 3.9

Both local and foreign clones have been subjected to a very severe test on extremely poor soil on Hedigalla Estate. The growth for two years and 4 months of age is definitely poor. Special attention will be paid to manuring and general cultivation in this area in order to bring the growth of the trees up to normal standards. Arrangements have been made to test new clones on commercial estates in 1957.

1950/1951 Clearings 19 $\frac{7}{8}$ Acres, Hedigalla Small Scale Clone Trials.—Three separate clonal trials were initiated in the 1950/1951 clearing in May-July, 1951. Girth measurements were taken in December, 1956. The average girth figures are given below:—

**1950 Clearing Hedigalla, Clone Trial No. 1
Planted in May, 1951.**

Clone	Ch 2	Ch 3	Ch 4	Ch 8	Ch 26	Ch 29	Ch 31	Ch 32	PB 86	LCB 870	Mean
Mean girth in inches Dec. 1956 ...	17.7	19.4	17.2	16.4	21.8	18.3	16.4	19.6	19.2	19.4	18.5

The above girth figures are satisfactory and the area will be tapped from March, 1957. The experimental tapping is carried out on trees with a girth of 18 inches and over on S/2, d/3, 67%. The early information on these Chemara clones will be most useful for further large scale trials and for making recommendations to the planting industry.

**1950/51 Clearing, Hedigalla, Clone Trial No. 2
Planted in May, 1951.**

Clones	RRIC 10	141/41 N	RRIC 9	RRIC 13	RRIC 15	154/41 N	DAR 34	PB 9/82	LCB 870	PB 86	Mean
Mean girth in inches Dec. 1956 ...	20.2	17.6	17.4	17.1	16.2	16.1	15.3	12.8	18.5	17.4	16.9

On the difficult virgin soil of our Hedigalla Estate, clones with an average girth of 17 inches and under are not up to the normal standards of good growth in replanted areas.

**1951/52 Clearing, Hedigalla, Clone Trial No. 3
Planted in July, 1951.**

Clone	Mean girth in inches
No. 52	16.6
„ 39	16.4
RRIC 14	15.3
No. 53	14.7
RRIC 12	14.4
RRIC 11	13.8
DAR 33	13.3
No. 54	13.1
„ 38	11.7
OY 1	10.2
No. 43	9.8
LCB 870	15.5
PB 86	14.9
Mean	13.8

The poor growing conditions can be judged from the growth of the control clone PB 86, which for 5½ years growth is definitely poor.

The following clone trials were initiated at Hedigalla Estate in 1955 and 1956:—

(1) **Large scale clones trial, 1955 clearing, 78 acres, Hedigalla Estate.—**

Clones RRIC 9, 11, 12, 13, 14, 41, 43, 46, 47, 49, 50.

(2) **Large scale clones trial, 1956 clearing, 60 acres, Hedigalla Estate.—**

Foreign clones—RRIM 612, 617, 618, 603, 605, PR 247, 228, 257, PR 258, 252, 253, 256, IRCI 1, 3, 5, 6, 9, AVROS 1191, 1328, 1447, 1851, PB 86, TR 1406.

Local clones—RRIC 39, 42, 48, 54, 55, 59.

(3) Clones GT 1, WR 101, AVROS 385 and 427 were planted on the same scale at Dartonfield Estate in 1956.

REPORT OF THE PLANT PATHOLOGY DEPARTMENT

By

Alfred Riggerbach

SUMMARY

Oidium Heveae:

The incidence of *Oidium* in the 1956 season was very mild. Because of this no useful conclusion could be derived from an experiment carried out to compare the effectiveness of Karathane and Sulphur dusts.

Gloeosporium Alborubrum:

A number of estates reported an attack of *Gloeosporium alborubrum*. Diseased material was examined in the laboratory and the fungus was found not only on young leaves, but also on green pods. In typical *Phytophthora* lesions on leaf stalks and on pods (during the *Phytophthora* season) *Gloeosporium alborubrum* was found associated with *Phytophthora palmivora*.

Phytophthora Palmivora:

Dusting experiments with fungicides of the dithiocarbamate type and with various copper dusts were carried out. Field observations have confirmed previous reports that trees with a heavy pod set are more heavily attacked by the disease.

Root Diseases:

Fomes (Leptoporus) lignosus was cultured with success on different media containing a decoction of cover crop or of old and fresh wood or of rubber, tea and cacao roots and also on cowdung.

The practice of dipping uprooted nursery plants (stumps) in cowdung solution to prevent drying out is considered dangerous and should be abandoned. The "White Root" disease may be spread by the cowdung solution to healthy plants. *Fomes (Leptoporus) lignosus* may grow more easily on roots plastered with cowdung.

Field Experiments:

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

Dusting Machines:

Several makes of dusting machines have been tested and compared in experiments carried out on Dartonfield Estate.

DETAILED REPORT

I. GENERAL.

A. Staff.—The Plant Pathologist was on duty throughout the year.

Mr. O. S. Peries, Technical Assistant to the Director, was appointed Assistant Plant Pathologist with effect from 22nd October, 1956. He was on duty throughout the year.

Mr. H. L. Munasinghe, Technical Assistant, left the Department on 3rd March, 1956, to proceed on a 6 months' training course under the Colombo Plan at the Waite Agricultural Research Institute, Adelaide. On 14th August, 1956, the Board, on a request from the Waite Agricultural Institute, extended the training period for a further 6 months.

Mr. E. G. Mendis, Technical Assistant, was on duty throughout the year.

Mr. T. M. Fernando, was appointed as Technical Assistant on 20th April, 1956.

B. Correspondence.—The correspondence has increased considerably during 1956. The corresponding figures for 1956 and 1955 are as follows:—

Correspondence	1956	1955
Incoming letters ...	972	591
Outgoing letters ...	1,132	411

These figures include both the advisory and the general correspondence.

C. Visits.—

Visits carried out	Advisory	in connection with R.R.I.C. experiments
(a) By the Plant Pathologist ...	27	16
(b) By the Assistant Plant Pathologist ...	39	—

The majority of the visits (66) were of an advisory nature, the remaining visits (16) were carried out in connection with field experiments of the Plant Pathology Department.

A considerable number of visits related to *Phytophthora* leaf disease and bark rot.

D. Visitors.—The Department received during 1956 a number of visitors, planters and agents of commercial firms.

Mr. L. B. Thrower, Plant Pathologist, Department of Agriculture, Papua, New Guinea, spent two days in the Department.

On 20th December, 1956, the Department arranged a demonstration of sulphur dusting on the occasion of the visit of the Chinese Trade Delegation.

E. Publications.—Since the Rubber Research Board decided to issue Sinhalese translations of the Advisory Circulars on Rubber Diseases a special abridged Sinhalese version of each of these circulars was prepared by the Smallholdings Department in collaboration with the Plant Pathology Department.

II. LABORATORY AND FIELD WORK.

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

The following diseases and pests were identified on specimens sent to the Plant Pathology Department for examination and report.

1. Diseases and damage of *Hevea brasiliensis* caused by:—

	<i>No. of Specimens</i>
(a) <i>Fungi or bacteria:</i>	
<i>Oidium heveae</i>	10
<i>Gloeosporium alborubrum</i>	6
<i>Phytophthora palmivora</i>	13
<i>Helminthosporium heveae</i>	2
Fomes (<i>Leptoporus</i>) <i>lignosus</i>	14
<i>Botryodiplodia theobromae</i>	5
Fomes <i>lamaensis</i>	3
<i>Ustulina zonata</i>	1
(b) <i>Pests and other causes:</i>	
Scale Insects	5
Mites and other Insects	4
Wind damage on leaves	3
Sun damage	7
Other causes	17

2. Diseases and damage of cover crop caused by:—

(a) <i>Fungi or bacteria:</i>	
<i>Synchytrium ovalifolium</i>	2
(b) <i>Pests and other causes:</i>	
Insects	5

3. Discolouration of crepe rubber:

Moulds	3
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Sun scorch of young plants is in many cases followed by an attack of *Botryodiplodia theobromae*. The young plant is considerably weakened and cannot therefore withstand the attack of the fungus.

B. *Oidium heveae*: General.—The general incidence of *Oidium heveae* during the 1956 'wintering' season was very mild. The reasons for this may be:—

- (a) The early wintering of the trees and the unusually dry weather conditions prevailing all over Ceylon at the time of refoliation.

- (b) Most of the rubber areas had already completely refoliated or at least partially refoliated when the weather conditions turned favourable for *Oidium*.
- (c) When the *Oidium* attack set in most of the leaves were already half mature and therefore past the very young and most susceptible stage.
- (d) The systematic sulphur dusting carried out this year and in previous years.

Due to these facts the canopy in most of the rubber areas was good, or even very heavy, when the wintering season was over. Also, as the flowers were not destroyed by *Oidium*, the pod set was generally heavy in areas planted with heavy fruiting clones.

Control of *Oidium* by sulphur dusting has now reached a high level of effectiveness and this effective control should be maintained.

Laboratory work.—*Oidium heveae* is an obligate parasite, which cannot be cultured on artificial media. However for laboratory work, different strains of the fungus can be maintained for long periods on living material (leaves) in the laboratory.

Preliminary experiments on these lines, carried out mainly by the Assistant Plant Pathologist, gave promising results and showed that the method, after perhaps a few alterations, may yield valuable information.

It is intended to use this method to test young plants for *Oidium* resistance.

Field Experiments.—One field dusting experiment was carried out during the 1956 season to compare the effectiveness of Karathane and Sulphur.

Karathane is a fungicide with 25% of an active ingredient, Dinitro-capryl-phenyl-crotonate, which has been successfully tried out against mildew diseases in other countries, especially in cases where sulphur, although effective, was found to be toxic to the tissue of some crops, particularly cucurbits.

The experiment was carried out at four different centres. On one estate (St. George Estate, Matugama) the experiment was carried out entirely by the Plant Pathology Department; on the other three estates, Kepitigalle Estate, Ankumbura; Igalkande Estate, Elpitiya; Niriella Estate, Uda-Karawita, it was carried out by the estates themselves, supervised and in close co-operation with the Plant Pathology Department. An area of 27 acres of a single clone in a single block, as square as possible and fairly accessible for dusting, was selected. The clone used was one which is known to be particularly susceptible to *Oidium*.

The following treatments were used:—

1. Dusting once per week with Karathane dust containing 1% of the active material Dinitro-capryl-phenyl-crotonate at 12 lbs. per acre per round (7 rounds).
2. Dusting once per week with sulphur dust at 12 lbs. per acre per round (7 rounds).
3. Dusting twice per week with sulphur dust at 12 lbs. per acre per round (14 rounds).

Each treatment was tried out on a 3-acre block area replicated threefold, making a total of 9 acres.

Leaf counting was done each week in two counting plots per acre, each measuring 5' × 10' in extent.

Unfortunately for this experiment, the incidence of *Oidium* was either nil or very mild on all the four estates. Kepitigalla, Igalkande and St. George Estates had no *Oidium* at all. Niriella Estate had only a very mild incidence. At Niriella Estate, the experiment was carried out in an area of clone Tjir 16 planted in 1939.

A fact which should perhaps be pointed out was the uneven attack in the 3 experimental blocks. The top sections of each block (1/3 of the acreage of each block = 3 ac.) had no *Oidium* at all.

Under the conditions of this experiment, Karathane dust (1% active material) applied once a week, seems to be as good as sulphur dust applied once a week, but is not so effective as sulphur dust applied twice a week.

As, however, the *Oidium* incidence was very mild and the result from only one estate is available, no final conclusion should be drawn from the results. The experiment will be repeated next year.

We are much indebted to the Superintendents of the four estates for giving an area, labour and considerable help in carrying out the experiment. The Karathane was supplied, ready for dusting and free of charge, by Messrs. Mackwoods, Ltd. to whom we express our thanks.

C. *Gloeosporium alborubrum*: General.—Several estates reported an attack of *Gloeosporium alborubrum* towards the end of the *Oidium* season 1956. Some areas were visited to diagnose the disease and in order to obtain additional information and material for laboratory investigations.

Laboratory work.—Leaves collected from areas heavily attacked by *Gloeosporium alborubrum* were examined in the laboratory. They were in no cases attacked only by *Gloeosporium alborubrum* but always by *Oidium* as well. In most of the cases *Gloeosporium alborubrum* was found associated with other fungi, more commonly with a fungus belonging to the group of the *Fusarias*. This *Fusarium* sp. was isolated and grown in culture for identification and further studies.

Later in the year *Gloeosporium alborubrum* was also found on green pods, which are very susceptible to attacks of this fungus. On the green pods *Gloeosporium alborubrum* was in most cases found associated with *Phytophthora palmivora* and it could even be successfully isolated together with *Phytophthora palmivora* from the typical *Phytophthora* lesions on the leaf stalks.

Infection experiments on pods and on young leaves have shown that *Gloeosporium alborubrum* is a true parasitic fungus as it can attack healthy young leaves and green pods. The leaves attacked by *Gloeosporium* need not have been previously attacked and weakened by other fungi such as *Oidium* heveae.

Laboratory tests with fungicides have shown that neither sulphur (wetable and non-wetable dust) nor copper fungicides (1% copper) has any effect on *Gloeosporium alborubrum*. Dusting with sulphur as a preventive measure against this fungus is therefore a useless operation.

D. *Phytophthora palmivora*: General.—The incidence of *Phytophthora* reached its peak in late June and early July, 1956, especially in the wet districts (Elpitiya and Kalutara).

The *Phytophthora* disease broke out about two weeks after the onset of the S.W. Monsoon. A second attack of *Phytophthora* during September/October did not occur owing to the failure of the N.E. Monsoon in 1956.

The fruit set of the trees is one of the most important predisposing factors for the incidence of the disease. This fact is realised when one considers the large quantities of the spores produced on the young green pods, the thin outer coat of which is an ideal culture medium for *Phytophthora*. The number of spores formed on attacked leaves is negligible compared with that formed on the pods. Spores will be carried by wind to neighbouring trees and to other areas. It is known that spores of a species of *Phytophthora* (*Phytophthora infestans*) may be carried by wind over distances of 40 and more miles (Gäumann, 1951, *Pflanzliche Infektionslehre*, Birkhäuser Verlag Basel).

In order to obtain more information about the disease a *Phytophthora* questionnaire, similar to the *Oidium* questionnaire, was prepared and sent to a large number of estates.

Laboratory work.—Isolations of the fungus from different sources were made. In practically all samples *Phytophthora palmivora* was found associated with *Gloeosporium alborubrum*.

Field Experiments.—Three field experiments were laid out.

Experiment A: Dusting experiment with four dithiocarbamates on Dalkeith Estate.

Experiment B: Dusting experiment with three copper products on Dalkeith Estate.

Experiment C: Dusting and spraying experiment with dithiocarbamates and copper formulations on Ellakande Estate.

Experiments **A** and **B** were carried out by the staff of the Plant Pathology Department, experiment **C** by the Superintendent of Ellakande Estate in close co-operation with the Plant Pathology Department.

Unfortunately due to difficulties in Colombo harbour three of the dithiocarbamates for experiment **A** did not reach the Institute in time to be included in the experiment.

The results of the experiments are:—

- (a) Ferspray as 4% dusting preparation was ineffective.
- (b) Both the copper oxide and the copper oxychloride dusts were effective.
- (c) There was no marked difference in the effect of the 6% and the 4% copper dusts.

It should be pointed out that copper dusts should only be used with the greatest caution as it is likely that a copper contamination of latex or scrap may occur.

“Washing down” experiments.—In close co-operation with the Chemistry Department “Washing down” experiments with different copper formulations were carried out. Small trees either with dry or wet leaves (by dew or artificial rain) were dusted by means of a “Bobby” hand duster with a certain amount of a copper fungicide.

After 24 hours, if no rain occurred, the copper dusts were washed down with water from a knapsack sprayer and the amount of copper dust still remaining on the leaves was determined and compared with the copper content of the leaves just after dusting. The determination of the copper on the leaf samples was carried out by the Chemistry Department.

The results of these experiments showed clearly that copper dusts stick much better, when dusted on wet leaves. There may be 20 times or more copper on wet-dusted leaves than on the dry-dusted leaves.

Dusting should therefore be carried out early in the morning when the leaves are wet with dew, or immediately after rain.

Acknowledgements.—We wish to thank the various commercial firms, listed below in alphabetical order, which gave the fungicides free of cost to the R.R.I.C. for these experiments:—

Baur & Co., Ltd.
Harrisons and Crosfield, Ltd.
Imperial Chemical Industries (Export) Ltd.
Mackwoods, Ltd.

E. Root Diseases: General.—Root diseases, especially the “White Root” disease, caused by Fomes (*Leptoporus*) *Lignosus*, are very predominant in replanted areas. Most of the samples sent to the Plant Pathology Department for examination and report, originated from such areas.

Laboratory Experiments.—Fomes (*Leptoporus*) *lignosus* was grown successfully on different culture media. Growth of the fungus was found to be excellent on media containing decoction or minced material of legume cover crop, old rubber wood, fresh rubber wood, rubber roots, tea roots, cacao roots and on cowdung.

Fomes (*Leptoporus*) *lignosus* may under field conditions grow with ease on any of the above if present in the soil. We would draw special attention to the growth on cowdung as it is customary in Ceylon to dip uprooted nursery plants (stumps) into a cowdung solution to prevent the roots of the plants from drying out. How effective is this treatment is not known but this custom is fraught with danger since it has shown that cowdung is an excellent medium for growth of this fungus.

If the cowdung solution gets accidentally contaminated with mycelium of Fomes (*Leptoporus*) *lignosus* or other root disease fungi, healthy stumps dipped in the cowdung solution may become infected and carry the disease into the replanted area.

Stumps treated with the cowdung solution are already provided with a favourable culture medium for the root disease fungus, when planted out in

the field. If they come in contact with only minute pieces of mycelium of *Fomes* (*Leptoporus*) *lignosus*, left in the soil from the old rubber stand, they may be infected more easily and the fungus will develop more rapidly and better on stumps covered with cowdung than on non-treated stumps.

Dipping stumps in cowdung suspension to prevent them from drying out is therefore a bad practice and should be abandoned.

Promising results have been obtained in the laboratory with certain fungicides and these will be further tested under field conditions.

F. Cracking of bark.—The Plant Pathology Department has had to deal with numerous enquiries, especially from smallholders, concerning the cracking of bark and oozing out of latex. This phenomenon is widespread on young, 2 to 4 years old, plants of clone PB. 86 and is a characteristic of this clone, especially in areas exposed to heavy winds.

Wounds not secondarily infected by fungi heal over quite naturally without any complication. However, in some sporadic cases, the wounds become infected with *Botryodiplodia theobromae* or with *Phytophthora palmivora* and in such cases infection of the wounds prevents the natural healing process and the wounds have to be treated with a fungicide.

Infected cracked parts may be detected by cutting away the bark and the coagulated latex. If black strands and discolouration of the cambium and of the wood underneath the bark (especially healthy looking bark) become visible, the cracks are already infected. If only coagulated latex is found, but no discolouration of the wood and cambium is observed, the cracks are healthy.

A leaflet on this subject was issued. This leaflet has also been translated in Sinhalese by the Smallholdings Department in collaboration with the Plant Pathology Department.

G. Field Experiments: Breeding for Resistance with Clone LCB. 870: 1952 Replanted Area, Dartonfield 2 acs.—The general growth of the seedlings in this area planted 5' × 30' has been satisfactory. When the Morris-Mann system of test tapping was carried out in this area in September, 1955, it was decided that early yield alone could not be relied upon as a criterion for thinning out the area, as the yields obtained were extremely low, averaging only 1—6 g. (range 8 to 0.2 g.) per tree per tapping. It was then concluded, that the best method of thinning out the area would be to uproot the obvious runts and then to thin out the rest on the basis of yield per inch of cut.

1953 Replanted Area, Dartonfield 1 ac., Oidium Research Experiment.—This area is planted with local and foreign clones for testing for resistance to *Oidium*. The trees are cut back each year, so as to facilitate various experimental inoculations and other useful observations.

1954 Clearing, Hedigalla 26.5 acs.—This experiment is designed to compare the effectiveness and the economics of sulphur dusting with that of crown budding for the control of *Oidium* leaf disease. The whole area is hedge-planted with clonal seedlings and budded stumps in alternate rows. The clonal seedling rows will be crown budded with LCB. 870 crowns and will not be sulphur dusted when mature, whereas the budded stump rows will not be crown budded, but will be sulphur dusted when mature.

1952 Hand Pollinated Seedling Trial, Hedigalla.—251 hand-pollinated seedlings from the 1952 hand pollination programme, consisting of crosses of the Oidium-resistant clone LCB. 870 and high yielding clones were planted out as stumped seedlings in 1954.

The planting distance is 3' × 30'. The stand per acre will be later reduced to about 160 plants per acre by selective thinning on growth characteristics. The remaining seedlings will be tested in the future for a combination of the two desirable characteristics namely, high yields and resistance to Oidium heveae.

1953 Hand Pollinations with Clone LCB. 870, Hedigalla.—652 of the above hand-pollinated seedlings are planted in the 1954 clearing at Hedigalla. Routine attention with regard to cultivation and manuring was given to this area by the Estate Department.

1955 Clearing, Hedigalla.—The following seedlings and budgrafts have been planted in the 1955 clearing at Hedigalla:—

Clone LCB. 870 crosses with high yielding clones	862 seedlings.
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Illegitimate seedlings of clone LCB. 870, Testatex classes 1—2	23 ..
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5-tree-clones from 31 LCB. 870 crossed seedlings	155 budgrafts.
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This material will be tested in the same manner as the other LCB. 870 crosses.

H. Dusting Machines.—Four makes of dusting machines were tested under field conditions in the course of the different experiments.

Reports concerning the machines were sent to the suppliers.

REPORT OF THE AGRONOMY DEPARTMENT

By

D. H. Constable

Summary:

The Department has been at full strength for only a short period of the year. Two Technical Assistants have been taken for training and proved unsatisfactory while our most senior Technical Assistant resigned with effect from 30th September on taking up a commercial appointment.

Our laboratory work has therefore been comparatively limited.

The proof that Zinc deficiency was unlikely to be a contributory factor in Oidium susceptibility in Ceylon was the most important finding of the year.

Manurial experiments have continued with clear and consistent results being obtained. Nitrogen is a major need for young clearings, Potash and Phosphate are of less importance.

Grass killing trials have continued. Most promise is being shown by an Amizole-Pentachlorophenol mixture.

The economic factor is the biggest difficulty in weed-killing on rubber estates. There are also considerable practical difficulties in the way of obtaining consistent coverage and regular spraying over steep and broken ground.

The soil survey has been started and representative profiles have been examined on most of our manurial experiments. Samples have been taken and are under chemical investigation.

Preliminary work on legumes and their bacterial relationships is under way. It has proved very difficult to establish Pueraria or Desmodium in pots with or without inoculation. Centrosema on the other hand has been simple to grow and independent of inoculation. This work is very much restricted by the non-availability of a greenhouse. Various bacterial strains with a satisfactory performance in Australia or Malaya are being multiplied. The search continues for indigenous strains likely to be of value.

Staff:

The Agronomist returned from end-of-contract leave and resumed duties on 1st February.

Mr. A. J. Jeevaratnam returned from study leave and resumed duties on 17th May, 1956. He has obtained the B.Ag.Sci. (Hons.) and M.Ag.Sci. degrees of the University of Adelaide. His return to Ceylon was routed via Malaya where he spent a period with the Rubber Research Institute studying their techniques.

Mr. T. C. Z. Jayman, Technical Assistant, who has been with us since 1951 resigned with effect from 30th September, on being appointed in charge

of the laboratory of the Oils and Fats Corporation. His departure left a considerable gap as we now have only one Technical Assistant with 18 months' service.

Two candidates were taken during the year for training as Technical Assistants. Neither proved satisfactory and the services of both were terminated.

The major difficulty is to inculcate an attitude of responsibility towards the work involved and towards the importance of research results being accurate.

New recruits have been interviewed and will join us in the New Year.

Laboratory Work:

This was rather curtailed this year owing to the loss of Mr. Jayman and to time wasted in trying to train the new Technical Assistants, a process which covered almost the whole year.

Fairly early we received private notice of the fact that the R.R.I. Malaya had observed heavy Oidium attack on plants deliberately starved of Zinc. The possible applications to Ceylon were obvious and we immediately sampled and analysed leaves of clones PB 86, Tjir 1 and LCB 870. The results showed Tjir 1 to have slightly the highest zinc content. The leaves taken were 30 days approximately after bud break and so were not at the most susceptible stage but they were comparable to those used in Malaya and it is obviously very unlikely that Tjir 1 could suffer from a Zinc deficiency in these circumstances. A short note on this matter was published in "Nature" in October.

Since then 108 samples from 4 replications of $3 \times 3 \times 3$ NPK experiments have been separately analysed for Zn and Cu. The results do not suggest a possible Zinc deficiency. The sampling areas are unquestionably prone to Oidium. Saphos Phosphate contains small quantities of all the minor elements except Molybdenum and Boron. It is possible that the regular use of this in the past has produced a satisfactory soil content of most of the minor elements. It may however be noted that on two estates tested neither N, P nor K manuring consistently affected the Zn or Cu content of Hevea leaves. These latter figures are summarized in Tables 2 and 3.

Further work has been carried out on total nitrogen in leaf stalks and the results are given in Table 4 which contains sets of results from two samplings at Padukka and one at Nakiadeniya. The increase in tissue nitrogen with manuring is clear but unfortunately purely relative and the method would require the use of control plants.

A number of soil analyses have been carried out and the data are summarized in Table 5.

Field Experiments:

The following are under study:—

- (1) Dartonfield $2 \times 2 \times 2$ NPK Trial.
- (2) Hedigalla, O, P, NP, PK and NPK Trial.
- (3) Hedigalla Spacing Trial.

- (8) **Epping Forest:** Very slight bias towards potash high mixture. Linear effect with increasing rates of application. Slight bias in favour of four applications per year.
- (9) **Degalessa:** Slight bias towards nitrogen high mixture. Otherwise the same as Epping Forest.
- (10) **Mirishena:** No difference between mixtures: slight bias in favour of higher rates of application. This latter effect quite clear in respect of the last 12 months growth with 13½% improvement at the highest level.
- (11) **Kepitigalla:** 20% effect of N on growth. No effect of P or K.

The overall picture is of a clear need for Nitrogen which may, on the average, be expected to give 10% better growth.

Potash gives a small but consistent positive effect and Phosphate the same but less marked than Potash.

The effect of all the elements begins to increase in the second or third years.

One of the most interesting observations was made at Nakiadeniya where three of the six (confounded) blocks are on an exposed hill top ridge. Exposure gave a significant girth setback of 7% and even the highest level of Nitrogen supply did little more than equal the no Nitrogen growth on the sheltered areas.

This result is confirmed on Hedigalla where we have a 5 × 5 Latin Square laid with the centre row right along the ridge. Here the centre row is 9% below either of the outside rows and with intermediate girths in the intermediate rows.

Weedkilling:

During the early half of the year investigations were based on Pentachlorophenol/2,4-D type mixtures. This followed the relative success of the Monsanto formulation RD 4196. Shell representatives tried a number of mixtures while the Institute tested 2, 4-D, 2, 4, 5-T, M.C.P.A. and T.C.A. as additives to P.C.P. No real success was achieved though formulations with Diesel Oil had some promise. Also Amizole continued promising though rather slow acting.

Work was deferred for several months while waiting for a knapsack sprayer with a side boom which gave an 8 foot wide sprayed strip.

On arrival of this sprayer work was started on Gallawatte and St. George estates to develop grass killers and on Pimbura estate to do strip weeding (of Mikania) for manurial applications.

The tests were of Amizole, Dowpon, P.C.P. and Sovacide, each alone. Pentachlorophenol gave immediate (6-12 hour) results but was followed within 7 days by complete regeneration of new and vigorous foliage. Dowpon worked within a week but was expensive (over 65/- per acre) and grass regeneration was comparatively rapid. Sovacide at 10 galls. per acre did not have any effect at all. Amizole was the slowest starting but appeared to give 100% effect lasting for at least a month. Costs of this material are not yet known,

Following this the effect of a mixture of half strength Amizole and half strength P.C.P. was tried. Kill was almost immediate and the effect lasted for at least six weeks.

Consistent effects with this mixture were obtained on grass at all three estates.

Mikania proved much more difficult to deal with than grass. Pentachlorophenol gave very temporary defoliation but the top layer of Mikania protected lower leaves and regeneration was rapid. No systemic action was apparent. Amizole alone appeared to be very delayed and long term in its action and therefore not suited to the purpose of obtaining a quick kill resulting in cleared sectors for manurial applications. Further trials were carried out with the PCP/Amizole mixture but no real success was obtained.

Soil Survey:

During the period under consideration soil profiles have been examined and samples taken from the following estates: Kepitigalla, Mirishena, Ambatenne, Epping Forest, Palmgarden, Ederapolla and Dartonfield. Standard methods of reconnaissance, profile recording and sampling were used. Forty-three soil samples and twenty-five samples of undecomposed, and decomposing rock have been collected from these estates.

In addition to examining soils on estates where manurial experiments are being conducted, profiles on roadside exposures have been described and sampled whenever possible. Seventeen soil samples and thirteen rock samples have been collected from these sources.

The following determinations are at present being carried out on the soil samples collected. Mechanical analysis including percentage over 2mm; pH; total N; HCl soluble K; and cation exchange capacity and content. Arising from these determinations there are several points of interest which may be further discussed.

(1) As mentioned in previous annual reports the gravel percentage is high forming as much as 70% of the entire sample taken, and as high as 75% in the top 3" of profile. This feature is common to many of the profiles examined. Obviously any consideration of soil texture and properties must take this aspect into account.

(2) All soil pH's so far determined have been more acid than 5.5. Cation exchange capacities are low and the total bases therefore very low.

(3) In general the potash content of soils appears to increase significantly with depth, this may reflect the increase of clay with depth.

Investigations have been made into the use of the soil hydrometer for mechanical analysis, and into ammonia and nitrate-N in soils. No conclusions have yet been reached.

Cover Crop Improvement: (By Mr. A. J. Jeevaratnam)

(1) By Inoculation.

Rhizobium strain R. 272 obtained from the R.R.I. Malaya in May, 1956, is being tried out for effective nitrogen fixation on the cover crops *Pueraria*

phaseoloides; *Desmodium ovalifolium* and *Centrosema pubescens*. Three test tube trials in agar block medium, three sand culture trials, and a preliminary pot trial using sterilized and unsterilized Dartonfield (0-6") soil have been carried out. More trials are in progress, using the above media and a sand × vermiculite medium.

In September, 1956, eight strains of rhizobia were obtained from South Australia. These included selections from material sent from Ceylon, while the writer was in Australia, selections from the U.S. Department of Agriculture and selections from the Queensland Department of Agriculture. Trials on four of these strains have been started.

Few attempts have been made to isolate new rhizobial strains from material available in Ceylon. Due to lack of adequate facilities to screen isolated strains, further work has been postponed.

So far only *Centrosema* has been successfully raised in pots and its growth has been independent of nodulation. Neither *Pueraria* nor *Desmodium* has grown satisfactorily even when nodulated. This comparative growth deficiency may be symptomatic of the trouble experienced in establishing field stands of these two species.

(2) Manurial.

Attempts are being made to study the effect of liming on the growth of the three legume covers using Dartonfield soil (0-6") in pot experiments. The soil used had a pH of 4.8 and a lime requirement of almost three tons per acre.

Miscellaneous:

Advisory work of the Department continued as usual, the correspondence figures being:—

Inward ...	486	Outward ...	558
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Meetings of District Planters' Associations were attended as follows:—

Kalutara ...	4
Ratnapura ...	2
Kurunegala ...	1

Talks on Wind Damage, and Manurial Experimental Results and Lectures on Potash were given at these meetings. For this latter lecture and slides we are indebted to the Verkaufsgemeinschaft Deutscher Kaliwerke in Hanover.

Thirty-four estate visits were made in connection with manurial experiments, twenty more visits were made for weedkilling and advisory work and four meetings of the Fertiliser Ordinance Advisory Committee were attended.

There were thirteen visitors to the Department.

One visit was made to the Coconut Research Institute, principally to discuss soil problems with the Agrostologist.

TABLE 1

(Reprinted from "Nature," October 27th, 1956).

Leaf content of Zinc in Hevea brasiliensis
(as p.p.m. oven dry tissue)

Sample		LCB 870	PB 86	Tjir 1
1	...	40	23	29
2	...	20	28	28
3	...	26	17	31
4	...	29	26	36
5	...	36	26	28
Average	...	30.2 ± 2.5	24.0 ± 2.5	30.4 ± 2.5

Leaf content in Zinc in Hevea brasiliensis
(as p.p.m. fresh tissue)

Sample		LCB 870	PB 86	Tjir 1
1	...	3.6	4.2	4.7
2	...	2.4	6.6	4.2
3	...	2.4	5.7	6.1
4	...	3.6	4.7	5.7
5	...	4.7	3.3	4.2
Average	...	3.54 ± .47	4.90 ± .47	4.98 ± .47

TABLE 2

Leaf content of Zinc in Hevea brasiliensis
(as p.p.m. oven dry tissue from 3 × 3 × 3 NPK Experiments).

		Padukka Group	Nakiadeniya Group
N ₀	...	22.9	18.4
N ₁	...	20.1	17.1
N ₂	...	22.0	18.8
P ₁	...	20.6	19.2
P ₂	...	23.0	17.8
P ₄	...	21.4	17.3
K ₀	...	22.5	19.5
K ₁	...	21.6	17.8
K ₂	...	20.9	17.5

TABLE 3

Leaf content of Copper in *Hevea brasiliensis*

(as p.p.m. oven dry tissue from 3 × 3 × 3 NPK Experiments)

		Padukka Group	Nakiadeniya Group
N ₀	...	10.5	10.2
N ₁	...	9.4	9.9
N ₂	...	10.2	10.4
P ₁	...	9.8	10.7
P ₂	...	10.1	10.0
P ₄	...	10.2	9.8
K ₀	...	10.0	10.5
K _½	...	10.1	10.5
K ₁	...	10.1	9.5

TABLE 4

Nitrogen in Leaf Stalks

(percentages oven dry tissue)

		Padukka	Padukka	Nakiadeniya
N ₀	...	0.93	0.96	0.90
N ₁	...	1.12	0.71	0.92
N ₂	...	1.06	0.75	0.96
P ₁	...	1.03	0.73	0.91
P ₂	...	1.03	0.71	0.83
P ₄	...	1.07	0.72	1.02
K ₀	...	1.03	0.72	0.97
K _½	...	1.05	0.71	0.91
K ₁	...	1.05	0.74	0.89

TABLE 5

Soil Analysis

	pH	Gravel	Total sand	Clay	Total N	Total K
Mirishena ...	4.7-5.2	29-61	82-38	12-48	.27-.06	.016-.047
Kepitigalla ...	5.6-6.8	11-22-nil	75-5	18-79	.13-.02	.030-.063
Ambatenne ...	4.8-4.9	23-44	90-61	6-29	.13-.04	.078-.073
Epping Forest ...	4.6-5.2	40-52	75-60	17-29	.12-.03	.023-.049

Note.—The above are a few typical results. The range of values is with increasing depth of sample. Gravel is the percentage over 2 mm. in diameter. Sand and Clay N and K are given as percentages of the residue after extraction of gravel.

TABLE 6

Dartonfield 2 × 2 × 2 NPK Experiment.

1938—19½ Acres Clearing

Girths in inches 1956.

	1	2	4	5	6	Average
O ...	27.5	25.8	31.2	26.2	24.5	27.0 ± 0.9
N ...	25.5	26.0	30.7	28.6	30.9	28.3
P ...	30.9	32.5	33.4	34.0	28.2	31.8
K ...	24.2	25.7	31.7	27.9	23.3	26.6
NP ...	30.7	30.7	33.6	30.0	32.0	31.4
NK ...	28.4	26.2	31.9	29.1	33.3	29.0
PK ...	29.1	33.6	35.2	28.5	29.8	31.2
NPK ...	29.8	31.2	36.7	32.4	31.8	32.4
Compost ...	33.7	32.9	34.6	32.7	33.6	33.5

N₀ 29.1 ± 0.45P₀ 27.9 ± 0.45K₀ 29.6 ± 0.45N₁ 30.5 ± 0.45P₁ 31.7 ± 0.45K₁ 30.0 ± 0.45

TABLE 7

Dartonfield 2 × 2 × 2 NPK Experiment
1938—19½ Acres Clearing
Yields in lbs. per acre (calculated).

	1	2	4	5	6	Average
O ...	617	458	555	578	625	566 ± 76
N ...	477	500	517	862	679	607
P ...	677	892	851	874	747	808
K ...	328	453	888	759	878	661
NP ...	1112	486	652	637	881	753
NK ...	778	503	626	835	823	713
PK ...	671	979	569	700	784	741
NPK ...	780	615	478	964	810	729
Compost ...	581	966	312	848	877	717
	N _o 694 ± 38		P _o 637 ± 38		K _o 684 ± 38	
	N _i 701 ± 38		P _i 758 ± 38		K _i 711 ± 38	

TABLE 8

Girth figures in inches for manurial experiment on
Hedigalla Station.

	A	B	C	D	E
1 ...	9.80 Nil	13.8 NP	12.4 PK	11.8 P	13.1 NPK
2 ...	10.5 PK	13.0 NPK	11.3 P	11.6 NP	9.9 Nil
3 ...	12.9 NP	10.9 PK	11.6 NPK	7.9 Nil	11.5 P
4 ...	13.3 NPK	11.5 P	9.5 Nil	11.4 PK	12.0 NP
5 ...	12.3 P	10.1 Nil	12.8 NP	12.9 NPK	11.4 PK

Nil ... 9.4

P ... 11.7 = 24.4% Phosphate effect. N_o 11.50"

NP ... 12.6

N_i 12.65" = 10.0%

PK ... 11.3

Nitrogen effect.

NPK ... 12.7

Effects due to exposure:

Average 1 ... 12.15"

2 ... 11.24"

3 ... 10.94" Average depression 9% due to planting along hill top.

4 ... 11.52"

5 ... 11.90"

TABLE 9

Girth figures in inches for manurial experiments on
Mirishena, Epping Forest and Degalessa estates, 1956.

		Mirishena	Epping Forest	Degalessa
R 8:6:4	...	13.0" (4.2")	5.0"	5.6"
R 6:6:6	...	13.0" (4.3")	5.1"	5.4"
R 4:6:8	...	13.0" (4.2")	5.2"	5.5"
Top level	...	13.3" (4.5")	5.2"	5.9"
2nd level	...	13.0" (4.3")	5.1"	5.7"
3rd level	...	12.9" (4.1")	5.0"	5.3"
Lowest level	...	12.7" (4.0")	4.9"	5.0"

Figures in brackets are the 1956 increments recorded on a 1952 clearing of Mirishena Estate.

TABLE 10

Girths in inches for manurial experiment on Kepitigalla
Estate.

	A	B	C	D	E
1	... 9.9 NPK	9.7 NP	7.4 Nil	7.4 P	8.1 PK
2	... 12.9 NP	10.4 PK	12.0 NPK	12.8 Nil	12.3 P
3	... 14.8 P	13.8 Nil	14.9 PK	16.7 NP	17.7 NPK
4	... 14.7 PK	13.2 P	17.1 NP	17.3 NPK	13.0 Nil
5	... 13.7 Nil	15.8 NPK	12.8 P	12.7 PK	16.0 NP
Nil	... 12.2"				
P	... 12.1"				
NP	... 14.5"		$N_0 = 12.15"$		
PK	... 12.2"		$N_1 = 14.50" = 19.3\%$		Nitrogen effect.
NPK	... 14.5"				

REPORT OF THE CHEMISTRY DEPARTMENT

By

E. J. Risdon

HIGHLIGHTS AND SUMMARY

The summarizing Report for the year 1956, reproduced in full below, has, in accordance with the Rubber Research Board's policy, been shortened in comparison with previous Reports, and is subdivided in the usual manner. The most interesting practical feature of the Report is the summary (Sub-section 5.3 commencing on page 64) of the information available on the extent of the contamination of latex, latex rubbers, scraps and of scrap crepes found when copper-containing fungicidal dusts are employed in the field, *e.g.* against phytophthora leaf disease. Subject to the necessary qualifying clauses given in the full Report, it would appear that the assumption, that under all Ceylon conditions the extent of contamination is necessarily negligible, is unjustified and incorrect. Pending the introduction and extensive testing of alternative fungicides or of suitable 'correcting processes' the information at present available on the 'mechanism' of contamination by copper from conventional copper-containing fungicidal dusts has been summarized to indicate how the risks of contamination might, perhaps, be minimised.

Further work on latex is summarized in Section No. 2 where reference is made to (a) the influence of certain anticoagulants and of other additives on the reliability of the metrolac, to (b) the possibilities of formalin (commercial formaldehyde) or of mixtures involving formalin for the prevention of pre-coagulation in latex obtained from areas, where certain systems of intensive tapping are employed and to (c) the R.R.I.C.'s present views on the suggestion that the conventional imported coagulants should be replaced by locally produced mineral acids.

Section No. 3 of the Report deals with the production of R.S.S. and work on various aspects of this subject continues to suggest that the ground floor (bulking room) of R.S.S. type smoke-houses can, with the appropriate modifications, be utilised for smoking and drying. At present the conversion is not necessarily cheap to carry out and some care appears to be needed in setting the control devices. Various attempts have been made to ascertain whether, with increasing crops, there is any justification for the assumption that tunnel type smoke-houses will dry and smoke full size normal thickness sheet in 3 instead of 4 days. In the small experimental unit drying in 3 days has been accomplished without difficulty, provided the coagulation and milling conditions are adjusted to limit the incidence of thick edges. A further investigation, under R.R.I.C. conditions, on the critical temperature at which pin-head type bubbles first appear as a result of overheating has confirmed that without some form of pretreatment it cannot be assumed that R.R.S. type smoke-houses can be operated above about 130°F. The use of steam to raise the humidity of the small sheet drying unit has so far confirmed the expectation that substantial increases in operating humidity (corresponding to restricted ventilation) has a significant and adverse effect on the drying time.

DETAILED REPORT

Section No. 1.—General:

1.1 Staff.—The Department consists of the Chemist, the Research Assistant, Mr. M. Nadarajah, B.Sc. (Ceylon), four Technical Assistants, Messrs. D. S. Muthukuda, T. S. Nathan, M. T. Veerabangsa and G. G. Gnanasegaram, and two Minor Staff Officers. Six to fourteen labourers are made available to the Department by Estate Department as and when required. Negotiations by the Administration for a Colombo Plan scholarship for the Research Assistant were successful and Mr. Nadarajah left for the United Kingdom in September, 1956. Mr. T. S. Nathan was appointed on probation as Technical Assistant in the Department with effect from 9th July, 1956.

1.2. Advisory Services, Correspondence.—The volume of advisory work during the period under review is slightly less than in 1955, but routine advisory visits to Estates, which generally require at least two Officers of the Department to be on tour in order that the Department shall have a clear picture of what is actually being done at the Factory involved rather than what is supposed to be done, and the preparation, checking, editing, etc. of the relevant confirmatory reports are still very time consuming. It is perhaps appropriate to emphasize again that many of the officers of the Department have to devote a large part of their time to advisory and experimental visits, correspondence, preparation of reports and to examination of the literature in connection with the advisory and other services provided by the Department for the industry in Ceylon. The normal uncertainty concerning the exact nature and volume of the advisory work makes the preparation of programmes and estimates for the Department rather difficult, as it is not necessarily possible to predict in advance how much time Assistant Staff Officers will be able to spend on the more expensive experimental work. The table below gives a summary of much of the data relevant to this Sub-section.

(a)	Unsolicited samples, etc. submitted for report or test ...	40
(b)	Solicited samples, excluding technical classification and fungicide contamination samples ...	18
(c)	Samples received in connection with fungicide contamination experiments, exclusive of samples collected on Dartonfield Group ...	893
(d)	Correspondence incoming ...	493
(e)	Correspondence outgoing, excluding items under (f) ...	463
(f)	Duplicated letters, Pamphlets and Leaflets outgoing ...	5
(g)	Groups of Visitors to the Department ...	42
(h)	Visits by the Staff of the Department (Details below) ...	185

		R.R.I.C. Estates	Other Estates	Other Visits	Total
Chemist ...	...	6	16	14	36
Research Assistant ...	...	2	8	2	12
Technical Assistants ...	...	8	67	38	113
Attendant, Peon ...	...	1	13	10	24

The figures in Column No. 2 of (h) above exclude all visits to Dartonfield Division (involving over 130 visits for the purpose of dusting and sampling), and in all the figures a visit to more than one Estate per day is classed as only one visit.

1.3. Publications.—The publications of the Institute, issued during the period under review, to which members of the Department have contributed partially or *in toto*, includes only the Annual Report for 1955. Two Information Leaflets on R.S.S. Bale Coatings and Marking Paints have been issued on a restricted circulation basis, brought up to date and submitted to the Editor of the Quarterly Circulars for consideration for publication. An article on the design and operation of temporary type smoke-houses is almost completed and two further articles on certain aspects of the drying and smoking of natural rubber are in various early stages of preparation.

In accordance with the Board's requirements this Report has been appreciably shortened in comparison with previous Reports, largely by emphasizing only the practical aspects of the large number of subjects with which the Department is at present concerned from time to time.

1.4. Miscellaneous.—Various samples and photographs for the Rubber Control Department and R.R.I.C. Stall at the 1956 Royal Agricultural and Food Exhibition in Colombo were prepared or collected by the Department with the assistance of other Departments of the R.R.I.C., of various Engineering and other Companies in Colombo and of a limited number of companies with interests in raw rubber production outside Colombo. Various Officers of the Department undertook limited periods of duty at the Exhibition. The Research Assistant and a Technical Assistant spent an appreciable time checking various inventories for audit purposes. The Chemist attended a number of meetings of the Kalutara District P.A. Acknowledgement is made to the Technical Officers of the B.R.P.R.A. in Welwyn Garden City and in London for advice, comments and suggestions on certain technical matters. Acknowledgement is also made to Estate Department R.R.I.C. for the temporary services of the Rubber Maker, Mr. O. de Alwis, on a number of the advisory visits. [For easy reference the numbering of the subsequent Sections and Subsections of this Report is, as far as possible, identical to that used in the Report for 1955.]

Section No. 2.—Latex:

2.1. Equipment.—An electrical conductivity apparatus ordered for use with latex has been delivered.

2.2. Approximate Determination of the d.r.c. of Fresh Latex.—Considerable reference has been made to this subject in the Reports for 1952 to 1955 and much of the relevant data has been summarized in an article in the Quarterly Circulars (1955 31-2 p.34-49) primarily with the object of indicating to Planters certain of the conditions where metrolacs can or cannot, as the case may be, be relied upon with sufficient confidence. Enquiries are still being received on this subject with particular reference to (a) the possibility of tappers 'cheating' the metrolac by means of the addition of various adulterants or diluents, and to (b) the effect of excessive proportions of certain anticoagulants. An example of interest in the former connection is the suggestion that tappers could and did use the juice obtained from the leaves of Wild Cinnamon (*Litsea Zeylanica*, locally Dawul Kurundu). Tests whereby the mucilaginous extract, obtained by grinding the leaves with water and straining, was added

to latex failed to show any evidence of an increase in the metrolac reading in comparison with the control diluted with an equal volume of water. While it is possible that the method of preparation was inappropriate, the viscous nature of the extract suggests that the expectation that the metrolac reading would be increased is based upon the erroneous assumption that with properly diluted latex the metrolac reading is governed by a relation between viscosity and d.r.c. rather than between density and d.r.c. No doubt the addition of considerable amounts of a viscous liquid might confuse inattentive operatives who do not dilute and mix the latex adequately; however, relatively large amounts of the extract appear to discolour the resulting crepe green and presumably this would show up in a small scale trial coagulation in the presence of bisulphite.

In the absence of chemical interaction between the anticoagulant solution and the components of the latex and of chemical reaction, *e.g.* decomposition, by the anticoagulant, the effect of the conventional anticoagulants on the metrolac reading can in theory be predicted from a consideration of the density and the volume of the anticoagulant solution added. Thus, as noted in the Report for 1955, the addition of a large excess of the cheap and readily available anticoagulant washing soda would not be expected and has not so far been found to favour the tappers. In the case of sodium sulphite the addition of large amounts of this chemical would also be expected to depress the metrolac reading but the information at present available concerning the use of intermediate quantities is confusing and is still under examination. Certain aspects of the effect of ammonia on the metrolac reading are mentioned in the article in the Quarterly Circulars referred to above; however, the range of ammonia contents and the time intervals between ammoniation and testing used were not very similar to the procedures followed when ammoniated latex is supplied to manufacturers of ammoniated centrifuge concentrate. Accordingly samples drawn on 7 tapping days from 4 tasks have been ammoniated to 0%, 0.1%, 0.15% and to 0.2% and the metrolac d.r.c. values determined about 3 hours after ammoniation. Under the conditions employed the average metrolac d.r.c. value increased with increasing ammonia content. Detailed analysis of variance figures suggest that the variance due to treatment (differences in initial ammonia contents) is significant in comparison with the variances due to the treatments x tasks and the treatments x days interactions. This has been interpreted to imply that the differences in mean d.r.c. values are significant. On this basis the practical implication of the experiment is that the addition of 0.1% to 0.2% of ammonia to freshly tapped latex can be expected to cause an increase in the apparent d.r.c., as estimated by the metrolac after about 3 hours standing, so that in the absence of an appropriate correction the factory excess can be less than expected, or, alternatively, the tappers can be credited with more rubber than would be the case in the absence of ammonia. In general, therefore, the evidence available herein and elsewhere does not support the view that the metrolac can necessarily be relied upon when the proportion of ammonia in the latex and the time between ammoniation and testing are not small.

2.5. Precoagulation.—Inquiries on this subject are still being received from Estates and, unfortunately, many of the inquiries strongly suggest that the relevant publications of the R.R.I.C. and R.R.I.M. have not been examined in detail. Information supplied by a limited number of Estates still indicates a lack of appreciation of the fact that, in general, where the tendency to pre-coagulation is marked the best results are often obtained by the early addition of the anticoagulant, *i.e.* before the latex reaches the collection centre and in many cases before field collection. Other Estates may, however, have been using unnecessarily large amounts of anticoagulant and in at least one case an

outbreak of bubbles in R.S.S. was probably due to the use of rather large proportions of washing soda for certain, but not all, of the clonal tasks involved.

The Department has had little recent experience of extensive pre-coagulation in latex of slaughter-tapped trees and, following a complaint from two outside Estates of pre-coagulation under these conditions, a brief investigation of the subject was made with the assistance of an Estate in the Kegalle District. In the particular area selected the tasks were of about 100 trees each with a plurality of cuts and upwards of 4 cups per tree and under these conditions it is to be expected that, if the latex is insufficiently stable or is not adequately stabilised in the field and rapidly delivered to and processed in the factory, coagulation difficulties in the factory (or earlier) might be encountered, possibly as a result of excessive microbiological contamination arising from the high total length of the cuts and from the large number of cups per task. Under these circumstances it might be anticipated that formalin (commercial formaldehyde) would be particularly effective as an anticoagulant and the R.R.I.M. has recently suggested that up to 0.08% of formaldehyde on the latex can be of value. In the example under discussion part of the difficulty could possibly be attributed to the poor quality of the cups used and to the very real difficulty of issuing the anticoagulant preferred by the Estate (sodium sulphite) to the non-resident tappers on the day of tapping. The small scale trials carried out by the Department indicated that about 0.06% of formaldehyde on the latex might be a marked improvement over the conventional procedures, and the use of formaldehyde alone and alternative mixtures involving the use of upto, say, 0.03% of formaldehyde with other anticoagulants are being examined on a larger scale by the Estates concerned. Commercial formalin containing 33% to 40% formaldehyde is generally available through Millers Ltd. at about Rs. 12/50 per Winchester bottle. According to the literature formaldehyde alone can produce rather dark sheets; nevertheless, there would at present appear to be ample justification for Estates, having extensive coagulation difficulties with slaughter-tapped latex, to attempt small scale trials with formalin. Some attention has also been given to the difficulties of latex transportation for R.S.S. manufacture in the Matale District.

2.7. Latex Coagulants.—In the Report for 1955 reference was made to (a) the testing on behalf of the Rubber Commissioner of various grades of D.C.I. acetic acid for the purpose of assisting in the disposal of stocks and to (b) the correspondence 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. During the period under review there has been appreciable correspondence with a further Government Department which, in accordance with Government policy, is considering the possibility of reducing or eliminating the importation of the conventional acid coagulants, replacing these acids as far as possible by locally produced mineral acids. In the case of acetic and formic acids the proposal is, in effect, that these acids should as far as possible be replaced by either or both of hydrochloric and sulphuric acids. An examination of the limited literature at the R.R.I.C. on the use of mineral acids has been supplemented by information kindly supplied by the R.R.I.M. and by J.P. and P.K. (formerly I.N.I.R.O.) as well as by various organisations in Europe. While the information available does not give a clear-cut answer to the problem, it is our present opinion that under current conditions in Ceylon a complete or substantial compulsory replacement of acetic and formic acids as latex coagulants by either, or both of hydrochloric or sulphuric acids might be accompanied by a distinct risk of enhanced corrosion of expensive milling equipment, *i.e.* crepe milling equipment, and of the production under certain circumstances of rather poor quality

rubber. Subscribers to R.R.I.C. publications requesting more explicit details on this subject will be supplied with copies of the relevant summarizing correspondence.

Section No. 3.—Smoked and Air Dried Sheet:

3.1. Coagulation.—Following an enquiry from a middle class proprietor concerning the supply of aluminium coagulating tanks in sizes smaller than the usual, a half size tank has been purchased partly for demonstration purposes and partly for 'make-up' purposes.

3.2. Milling.—In connection with attempts to smoke sheet in the tunnel type smoke-house [Subsection 3.4 (4)] in less than four days, an investigation into the relationship between the proportion of coagulant used, the depth of latex in a conventional aluminium coagulating tank and the width of the resulting coagulum milled on a Brown's Guthrie Cadet has commenced, primarily with the object of ascertaining whether, as suggested in the literature, 15" depth of latex is a practical proposition for these locally produced mills. A brief examination was made at an outside Estate of a multiple milling battery with 6 pairs of rollers. As units of this size are rather rare in Ceylon and can have a higher output than the conventional Ceylon milling batteries, it is hoped that a unit of this type can, in due course, be purchased for experimental and demonstration purposes. Advisory visits and correspondence in connection with the use of multiple rollers has suggested that in a number of cases low output rates could be attributed to too slow feeding of the coagulum. An example of marked tearing and of 'bunching' on different pairs of rollers of a single battery was attributed to incorrect installation or reerection after repairs, of the driving gears.

3.3. Rust on R.S.S.—An appreciable proportion of the advisory visits in connection with the production of R.S.S. have been undertaken with a view to decreasing the incidence of rust. In the majority of cases the rust could apparently be attributed to one or more of the following: (a) inadequate washing during and after milling, (b) unduly prolonged effective dripping times, where the effective dripping time is defined as the interval between the end of milling of the particular piece of coagulum and the time when this piece of coagulum reaches normal smoking temperature or (c) attempting a preliminary air drying in a crepe tower operated at low temperatures and under conditions distinctly unfavourable to moisture removal. In connection with these comments it might be mentioned that dripping times upto seven hours are still being encountered, and that under our conditions crepe towers can be used for part of the drying provided they are operated at elevated temperature. Our experiments with partial smoking (Report for 1953 p. 15-16) involved the use of air drying at elevated temperatures after a preliminary smoking designed to reduce susceptibility to microbiological action.

3.4. Drying and Smoking.—Considerable attention has again been given to various aspects of this subject and this Subsection of the Report is, as usual, subdivided into suitable portions.

(1) Application of Basic Principles: In the Report for 1955 reference was made to the fact that when the small drying unit was operated at rather high ventilation rates but without any other form of humidity control sheets of dry weight equivalent to 8 ozs. per sq. ft. dried in under 4 days at an average operating temperature of 120°F. This observation has been confirmed during the period under review and further work in connection with the incidence of bubbles and blisters has tentatively indicated that by a suitable choice

of processing and drying conditions sheets of dry weight equivalent to 8 ozs. per sq. foot can be dried in the small drying unit in well under 3 days without the appearance of bubbles or blisters. The data also gave a clear tentative indication of the critical temperature above which bubbles might be expected in the absence of a suitable pretreatment of the coagulum. As far as is known drying in 3 days, and drying in 4 days at an operating temperature not above 120°F, are seldom equalled under commercial conditions in Ceylon and the conventional R.R.S. type smoke-houses are not generally expected to dry R.S.S. in less than 5 to 6 days when operated in the range 120°F-130°F. No doubt the relatively poorer performance of some commercial units can be attributed to the absence of any form of temperature measuring instruments and to the very much longer time that the doors are open each day for sheet movement, etc.—in some cases 8 hours.

During the period under review various nozzles and other control devices for steam injection have been produced by Estate Department and tested with a view to modifying the small experimental smoke-house for operation at raised but controlled relative humidities. The technical literature clearly indicates the importance of the ambient relative humidity during the early stages of drying, but the importance, if any, of the relative humidity during the much longer later stages of diffusion controlled drying is not very clearly defined, although much early and recent literature published outside Ceylon and the method of operation adopted for a number of smoke-houses inside Ceylon seems to imply that there is a considerable body of opinion which subscribes to the view that appreciable increases in ambient relative humidity during the later stages of drying are of relatively minor importance. Our early published small scale experiments with crepe laces in a closed atmosphere at tropical room temperature did not entirely support this view, but, as it was fully appreciated that the experiments could not be beyond criticism, it was proposed to repeat and expand the tests on a larger scale with R.S.S. and crepe and these tests are now in progress. The preliminary tentative indications are that the increases in drying time of A.D.S. at present found when operating at the elevated relative humidities sometimes encountered in commercial smoke-houses may not be insignificant. The probable implication of any definite connection between R.S.S. or A.D.S. drying times and relative humidity (when the latter is appreciably above the value corresponding to the moisture content of the outside air) upon the advisory correspondence in connection with smoke-houses will be discussed at a later date.

(2) Construction and Operation of Temporary Type Smoke-houses: Considerable reference has been made to this subject in the Reports for 1954 and 1955. During the period under review a number of these smoke-houses have been reexamined primarily with a view to obtaining informations or opinions on any unexpected structural or other defects observed only after an appreciable period of commercial operation. As the subject is of considerable current interest a start has been made to the preparation of a descriptive article with diagrams for submission for publication in an issue of the Quarterly Circulars, and it is therefore not proposed to give further comments here on the numerous temporary type smoke-houses in commercial use in Ceylon.

(3) Permanent Smoke-houses—R.R.S. Type: The background to this subject is summarized in reasonable detail in the Reports for 1954 and 1955, where it will be observed that the primary object is to examine ways and means of increasing the capacity of the medium and larger size multi-storey R.R.S. type smoke-houses in order that these units shall, if required, be able to deal with at least a portion of the extra crops anticipated when replantings come into bearing. In the first instance attention has been given to the possibility

of using the ground floor bulking space for smoking and drying. For this purpose the relatively small R.R.S. smoke-house at the Nivitigalakele Division of the R.R.I.C. was converted to this system of operation in 1954. The preliminary tests carried out in 1954 and 1955 indicated that the basic design adopted appeared to be adequate in principle but not entirely satisfactory in commercial operation due to the incidence of a small proportion of blisters. During the period under review considerable attention has been given to this subject and, after certain appropriate but relatively inexpensive alterations and additions, the operational difficulties appear to have been overcome. This smoke-house has been in commercial operation under Estate Department control and the internal report supplied by the Estate Department indicates that the unit will dry normal thickness R.S.S. in not more than 5 days even when operated at or near its enhanced full capacity. There are still certain structural objections to the unit, of which the most important is the high cost of the outside metal arch furnace employed. An expensive furnace of this nature was fitted to ensure that should there have been any unexpected difficulty, the Department could be reasonably certain that the difficulty would probably not be due to the use of an 'unproven' type of furnace. It is proposed to investigate the use of alternative cheaper furnaces.

During the period under review an appreciable number of detailed tentative designs have been prepared for commercial Estates wishing to convert R.R.S. type smoke-houses for operation with smoking on the ground-floor. As the preparation of these detailed drawings, often with later amendments of Estate requirements, is rather protracted, it is hoped that the designs will be finalised and acted upon in full in the divisional factories concerned. In one case in the Kalutara District the modifications to a smoke-house have been completed and the modified unit put into commercial operation. After adjustment of the control devices by the Department it is understood that this smoke-house has given satisfactory results.

(4) Permanent Smoke-houses—R.R.I.M. Tunnel Type: Reference has been made to this subject in earlier Reports, where the reasons leading to the decision to build a tunnel type smoke-house at R.R.I.C. are explained. During the period under review the method of operation of this type of smoke-house has been demonstrated to numbers of Estate Managers proposing to increase their R.S.S. output in the future. The present advisory policy in this connection is to encourage Managers to send Rubber Makers unfamiliar with tunnel smoke-houses to R.R.I.C., to obtain limited instruction in the method of operation, before taking these smoke-houses into full commercial use. Arrangements have been made with Estate Department to increase the size of the present trolleys and it is anticipated that this work will be completed shortly. Following the observation that by appropriate adjustment of the operating temperatures sheet could be dried in well under 3 days in the small drying unit [Subsection 3.4 (1)], attempts have been made to operate the tunnel type smoke-house commercially on a 3 day instead of a 4 day smoking cycle. Up to the present there have been a number of unexpected but, fortunately, not very serious difficulties, and, as the increase in daily capacity which would be found with a reduction in the smoking time is considered to be of commercial importance, it is proposed to revert to this subject when the extensions to the trolleys are completed.

Considerable time has again been spent by a Technical Assistant at a commercial tunnel type smoke-house where the metal arch furnace had buckled severely, probably due in part at least to the inclusion of an unorthodox insulating wall around much of the outside of the metal arch. A Technical Assistant was on duty at the Estate during the period when rebuilding of the

furnace by a local contractor commenced. In order to minimize the risk of faulty erection of other metal arch furnaces, certain Estate Managers have been advised to consider instructing small local contractors to visit the R.R.I.C., by appointment, to have certain of the more important points of the design explained and illustrated to them in full.

(5) Permanent Smoke-houses—Other types: It is of interest to record that the principles suggested for the construction of certain temporary type smoke-houses and for the modification of permanent R.R.S. type smoke-houses have been incorporated in a limited number of new and novel permanent type smoke-houses and more detailed reference will probably be made to this subject at a later date.

(6) Air-Dried Sheet: Tentative inquiries for this material have been received from a local manufacturer, but no progress could be made at that time as R.S.S. was then at a premium *vis-à-vis* crepes on the Colombo market. The tunnel smoke-house is equipped for making A.D.S. using a direct oil fired burner connected to the main longitudinal flue. This arrangement is not cheap to instal and to operate, and it is proposed in due course to consider alternative arrangements.

3.5. R.S.S. Bale Coating and Marking Composition.—The major portion of the work on this subject has been written up in two Information Leaflets (C/56/2 and C/56/3), copies of which were circulated to Packers in Colombo and Galle, to various Planting Organisations and to certain Government Departments. The leaflets have been brought up to date and are now available for publication in the Quarterly Circulars. Further work on this subject will probably be undertaken in 1957.

Section No. 4.—Blanket and Sole Crepe:

4.1. General.—The advisory work in connection with this Section has mainly been concerned with the elimination of discolouration of crepes prepared with the use of R.P.A.3.

4.2. Coagulation.—The corresponding Subsection of the Report for 1955 deals mainly with the possibilities of oxalic acid as a crepe coagulant. The views of the R.R.I.C. and much of the available literature are summarized in a leaflet distributed in 1955. During the period under review the distribution, *gratis*, of small samples of oxalic acid for preliminary trials by Estates has continued and there have been inquiries for further information and requests for advisory visits. Correspondence on this subject with other Estates and with the importers suggests that appreciable numbers of Estates have found oxalic acid to be attractive for the preparation of latex crepes without a fraction but with RPA.3, and there is stated to be at least one instance where quite small, and hence highly economic, amounts of the acid were used successfully. Further attention has been drawn to the poisonous nature of oxalic acid by the Government Labour Medical Officer, with particular reference to the possibility of systemic poisoning. In this connection a major local importer of oxalic acid has indicated to the R.R.I.C. his intention to distribute a leaflet, approved by the Labour Medical Officer, with new deliveries of the acid and Estates which are using oxalic acid and have not received a copy of this leaflet are advised to obtain a copy from Messrs. Mackwoods Ltd.

4.4. Milling.—Although the estimate and programme for 1956 were both framed on the expectation that considerable attention could be given to this subject, this has not, in fact, been possible, primarily because the motors referred to in the Report for 1955 were not delivered until just before the end of 1956.

4.5. Bleaching Latex for Crepe Manufacture.—There has been little experimental work on this subject during the period under review. However, the advisory services have involved visits by the Staff of the Department to appreciable numbers of crepe Estates having discolouration difficulties. Mention might be made in this connection of the procedure followed at a limited number of Estates whereby water-miscible panel fungicide, *e.g.* 10% Brunolinum Plantarium, is applied immediately before tapping. Subject to a more detailed examination there would appear, at least under certain conditions, to be some objections to this procedure; thus, tappers carrying a bottle of Brunolinum Plantarium may not invariably be willing to carry and use a bottle of anticoagulant also, where this is necessary, and, secondly, Brunolinum Plantarium may have a mild coagulation action and would therefore be expected to enhance any tendency to pre-coagulation as a result of a failure to use anticoagulants at the tree.

4.7. Hardness of Sole Crepe.—Following complaints of poor wearing quality against limited quantities of Ceylon sole crepe in 1954, a survey of the hardness (M_{50}) of sole crepe samples produced on certain Estates was carried out by the Department and in 1955 a sample lot of unusually hard sole crepe was despatched to London for testing. The information received about this sample lot during the period under review does not suggest that further work can at present be usefully carried out on this subject by the methods previously in mind.

Section No. 5.—Compounded Rubber:

5.1. Equipment.—The major portion of the equipment recently ordered in connection with the work under this heading, including an oxygen bomb ageing outfit has been received. The oxygen bomb is now in the course of erection.

5.2. Technical Classification of Ceylon Rubber.—Reference has been made to this subject in almost all previous Reports. The Report for 1955 indicated that the commercial position in Ceylon has remained substantially unchanged partly because the bulk of Ceylon R.S.S. is shipped to China and partly because any large scale commercial production of T.C.R. by Packers would probably entail expenditure over and above normal, *e.g.* for blended packing. The position has remained the same during the period under review and the volume of experimental sampling and testing in this connection has been materially reduced in comparison with the corresponding period of 1955.

5.3. Copper Content of Ceylon Rubber and the use of Copper-Containing Fungicides.—The background of this subject is given in considerable detail in the Report for 1955, where particular attention was drawn to the fact that the total copper content of latex rubbers, of scraps and of scrap crepes even from undusted areas is not negligible. The practical implication of this observation, from the viewpoint of the contamination obtained as a result of the use of copper-containing fungicidal dusts, is that the degree of contamination must be limited if the resulting rubber is to meet the R.M.A. specification (of not more than 8 parts of copper per million of rubber). The Department's reluctance to accept any suggestion that contamination would necessarily be substantially negligible under normal commercial dusting conditions was explained in detail; but, on the basis of the analytical evidence available at the end of 1955, it was concluded that the degree of contamination might be rather less than expected and the Department was therefore obliged to accept the view that there appeared to be little

justification for preventing the careful use of fungicidal dusts containing relatively small amounts of copper on a restricted experimental scale. During the period under review the dusting experiment at Dartonfield, commenced in August, 1955, has been continued by the Department with dusting about once in every 2 weeks and with sample collection at, usually, every tapping. At the same time an area, adjacent to, but lower down the slope than, this experimental area and into which dust may have drifted, has been sampled at, usually, every tapping for a period of about a year. At the conclusion of this period this 'drift' dusted area has been dusted about once in every two weeks with sampling at, usually, every tapping. A leaflet, No. C/56/1, requesting Agency Houses to ask Estates likely to undertake dusting with copper-containing fungicides to despatch to the R.R.I.C. suitable samples, (details for the preparation and collection of the samples were given in full in the leaflet), from the dusted and control areas was circulated early in the year and an appreciable number of samples collected in connection with this leaflet have been received. The total copper content figures of the approximately 1680 samples of latex films, latex crepes, scraps and scrap crepe examined upto the end of November, 1956, are summarized in the table below:

Dusting Experiments with Copper-Containing Fungicides, 1955-56

Summarizing Table

Row No.	Sample Type	Drawn from (Field Treatment)	Copper Content Readings (p.p.m. on t.s. or d.r.c.)		
			No. of Readings	% above 7.9 p.p.m.	Highest Value
1	Latex unprocessed t.s. film	Copper Dusted Areas	134	17.9	30
2	Do.	'Drift' Dusted Areas	86	0.0	7
3	Latex processed as (a) Blanket Crepe	Copper Dusted Areas	239	0.8	13
4	Do.	'Drift' Dusted Areas	58	0.0	4
5	Do.	'Control' Areas	68	0.0	3
6	With (b) Fraction Crepe	Copper Dusted Areas	78	1.3	39
7	Do.	'Drift' Dusted Areas	34	0.0	4
8	Scrap unprocessed (Snap Samples)	Copper Dusted Areas	268	22.0	67
9	Do.	'Drift' Dusted Areas	172	8.1	11
10	Scrap processed as Blanket Crepes	Copper Dusted Areas	353	9.1	179 (100)
11	Do.	'Drift' Dusted Areas	99	0.0	7
12	Do.	'Control' Areas	93	0.0	7

In the table above no attempt has been made to separate the information obtained from the individual and largely incompleted experiments, and although this method of presentation has the advantage of brevity it is, of course, liable to produce a bias in favour of the information obtained from the experiments of which the largest number of samples have been examined.

It must also be appreciated that the inherent inaccuracies and the general difficulties in this type of work could mean that the data summarized in the table is representative only of the areas, the types of dust and of the particular procedures involved: however, as the data refer to samples collected from at least six different areas it may be quite reasonable to assume that the individual experiments give an interim picture of the extent of contamination resulting from the use of present day copper-containing fungicidal dusts under certain commercial conditions. On this basis it is concluded that the assumption, that the use of the majority of the present day copper-containing fungicidal dusts against phytophthora leaf disease of rubber in tapping does not raise the copper content of the conventionally processed latex rubbers and of the panel and shell scrap crepes upto and above the upper limit specified by the R.M.A. does not apply under many Ceylon conditions. This is particularly obvious in the case of scrap crepes (*vide* Rows No. 10-12 of the table) where two samples contained sufficient copper to be tacky at the time of analysis—about four weeks after collection. In the case of latex crepes (*vide* Rows No. 3-7 of the table) the extent of contamination would appear to be of lower order but, nevertheless, not negligible. In the latter connection it will be noted that there is evidence that the copper content of latex obtained from dusted areas is liable to be higher than the copper content of latex drawn from areas into which the dust may have drifted by accident, and that, although much of the copper is removed in processing as crepes, the final values can be above 8 p.p.m. (the relevant data are included in Rows No. 1-7 of the table).

It is to be expected that under normal conditions the major source of contamination will be either or both of (a) imperfect dusting techniques, *i.e.* dusting in such a way that appreciable dust fails to reach the canopy or is readily reflected back by the canopy, and (b) natural leaching of the dust from the leaves and bark onto the panel and into the shell. Upto the present the small scale experiments specifically designed to test the above and other assumptions concerning the methods by which contamination can, or may reasonably be expected to, take place have given clear indications that:

(a) All the commercial and experimental dusts examined to date—including some dusts containing a 'sticker'—are at least partially washed off the surface of the leaves by artificial or natural means.

(b) Under particularly adverse conditions of artificial leaching when a tapping is in progress, the copper content of the partially washed out latex can rise to a figure above 500 p.p.m. on the total solids. Under these conditions the scraps obtained on the subsequent tapping are, of course, high in copper.

(c) Incorrect dusting, in particular stationary spot dusting with the nozzle pointing slightly lower than usual, can raise the copper content of the scraps drawn at the subsequent tapping.

While the experiments mentioned above cannot yet be regarded as completed, it is difficult, even at this stage, to avoid the conclusion that under normal commercial conditions leaching by rain will, in fact, be a major source of contamination. Thus, of the high copper content latex crepes included in Rows No. 3 and 6 of the table all but one—for which the necessary data is unfortunately not available—can be explained on the basis of partial washouts during tapping, if it is assumed that when the latex contains appreciable copper dust much of this dust is preferentially removed with the fraction or alternatively is not necessarily readily milled out of the fraction. The information at present available on the contamination of scraps and scrap crepes does not suggest that the extent of contamination is necessarily solely governed by the incidence of

partial washouts, and in this connection it should be noted that (a) the proportion of copper removed from scraps during normal processing is probably appreciably lower than that removed in the conventional latex crepes process and that (b) in very heavy monsoon showers the extent of contamination by leaching onto dry or partially dried scraps in the field might be quite small. Subsidiary experiments carried out at the same time as those mentioned above appear to suggest that when dusting is carried out in the vicinity of the factory the windows of the lofts should be closed, and that, if dusting is delayed or prolonged until the time of collection and delivery of latex, then open vessels, e.g. buckets, containing latex should not be allowed to pass near the dusting machine.

The data summarized above strongly suggests that some degree of contamination is liable to occur when copper-containing fungicidal dusts are employed during the 'phytophthora season' on areas of rubber in tapping. As the information at present available does not yet permit us to suggest how all the extra copper can be satisfactorily removed or inactivated at the producer's factory, it would *at present* appear that, unless consumers indicate that they are prepared to tolerate copper contents appreciably above the R.M.A. specification limit, the minimum precautions necessary for the successful use of dusts must probably include at least the following: (a) the areas dusted must be restricted as far as possible (*vide f*), (b) the quantity of dust used and the copper content of the dust should follow the recommendations of the R.R.I.C., in particular heavy dusting rates and the generous use of dusts which are very high in copper should be limited to small experimental areas only, (c) the dusting should be carried out according to conventional procedures with, if possible, the shells inverted (*i.e.* top downwards), and practices such as stationary spot dusting and testing a stationary machine inside mature rubber areas should be prohibited, (d) dusting should not be carried out on the day of tapping, (e) latex collected from dusted areas during partial washouts should be discarded, (f) stable latex collected from dusted areas during dry weather should not be bulked separately but should be added to, and well mixed with, the much larger main bulk to ensure dilution with much latex from untreated areas and (g) all scraps and all cup lump from dusted areas (and, unless the dilution implied by (f) is large and the latex uniformly stable, all first fraction also) should be discarded and burnt, particular care being taken to ensure that tappers do not take advantage of this apparent wastage of scrap etc. to augment their income by retaining the scraps themselves. As it may well be difficult to ensure that contaminated latex crepes and scraps etc. do not reach dealers and remillers, where they will probably be regarded on the basis of visual appearance rather than technological behaviour, it might at this stage be most appropriate to take the areas requiring dusting with copper containing fungicides out of conventional tapping during this dusting season.

Due to the inherent inaccuracy of the analytical and sampling procedures etc. (*vide supra*) several protracted attempts have been made to develop an indirect but relatively reliable method of assessing the active copper content of prepared natural rubbers, but upto the present these attempts have not been an unqualified success. Briefly, much of the difficulty would appear to be due to the fact that the samples of raw rubber used showed marked differences in their resistance to accelerated (oven) ageing tests in the absence of copper and in their behaviour in the presence of added copper. Nevertheless, these tests do not indicate that the copper used in fungicidal dusts can be regarded as technologically inactive and tests of this nature have been used to obtain a confirmatory indication of whether a number of the samples included in the figures in the table above are in fact not very high in copper. It is hoped that further attention can be given to this subject at a later date.

Estimations, on behalf of the Plant Pathologist, of the copper on the surface of leaves dusted by the Plant Pathologist (a) when dry and (b) when wet indicated that with the majority of the conventional dusts wet leaves retain much more copper than dry leaves. As the work summarized above probably gives an adequate interim picture of the extent of contamination (in the absence of effective rainguards) of latex, latex crepes, scraps and scrap crepes under certain Ceylon conditions when conventional commercial fungicidal dusts based upon copper are employed, it is proposed during 1957 to give further attention to (a) the mechanism of scrap contamination, (b) the possibilities of rainguards and of improved 'stickers' and to (c) methods of removing or inactivating copper in dry rubber or latex. It is anticipated that the long term dusting experiments at Dartonfield will be continued with relevant modifications.

5.4. The Use of Certain Organic Fungicides.—Reference is made to this subject in the Report for 1955 with rather more detail in the corresponding half yearly Report, and it is clearly implied that, in the large scale use in the field of an organic fungicide, due note must be taken of the possibility of contamination of the dry rubbers and latex and, therefore, of the influence of the fungicide on the preparation, processing and ageing behaviour of the raw and compounded rubber and latex. The warnings, given by the Department in the correspondence and Report for 1955, concerning the possibility of extensive contamination with 'active' copper following any large scale use of conventional copper-containing dusts against phytophthora leaf disease, probably helped to induce a considerable number of Planting Companies to give considerable thought to the use of organic fungicides and during the period under review fairly extensive trials have been carried out on some commercial Estates with dusts based on fernspray in sulphur or talc, usually 4 per cent fernspray in sulphur. The active ingredient of fernspray is believed to be ferric dimethyldithiocarbamate and previous reports and information received from outside Ceylon have clearly indicated that ferric dimethyldithiocarbamate and substantially undiluted fernspray can have a pronounced effect on the vulcanising and processing properties of compounded rubber.

It is our impression from the literature that responsible spokesmen of the consumers' organisations are probably prepared to consider each individual organic fungicide on its own merits, provided they can be assured that every reasonable precaution will be taken to limit contamination. In this connection it should be remembered that increasing emphasis has in recent years been placed on technological uniformity—hence the T.C.R. scheme—and to a lesser extent on reduction of the scorching tendency of certain rubbers, so that it should not be assumed that consumers will necessarily welcome the large scale use of fernspray in sulphur in place of copper. Information in the preceding Subsection of this Report has indicated that upto the present the largest extent of contamination encountered with copper from copper-containing dusts used under normal commercial conditions is in the range 100 to 200 p.p.m. of copper and it is, therefore, of interest to record that our strictly limited tests have indicated that the addition of 250 p.p.m. of undiluted fernspray can decrease the strain value obtained under the T.C.R. conditions by between 4.8 and 12.8 units, depending upon the samples of raw rubber used. At undercures of the order of 20' (instead of 40') even 100 p.p.m. of fernspray can decrease the strain value by between 4.5 and 14.7 units. In the former connection it should be remembered that the upper and lower levels of the producers' marking limits for yellow T.C.R. differ by only 12 strain units. If it can be assumed that the extent of contamination with 4 per cent fernspray is likely to be numerically similar to that found with the conventional (4% and 6%) copper dusts, then it would at this stage appear to be reasonable to suggest

that the large scale use of 4 per cent fernspray cannot be expected to be conducive to the production of technologically uniform scrap crepes, although the information from our small scale T.C.R. scrap crepe surveys do not suggest that much of the rubber produced would be unsaleable under the T.C.R. scheme, *i.e.* outside the lower limit of the blue class. In the case of latex rubbers where the extent of contamination with copper appeared to be of a lower order, *i.e.* maximum copper content in the range 10-40 p.p.m., there would appear to be a certain element of risk with fernspray as even 30 p.p.m. of fernspray can with certain samples reduce the strain value under the T.C.R. test conditions by not less than 4 strain units (and by not less than 7 strain units in undercures, *i.e.* 20'). Under these circumstances Estates making fraction crepes or R.S.S. which would be classified low down in the blue class would run the risk of supplying an increased proportion of latex rubbers which are unsaleable under the T.C.R. scheme and which might in fact be very scorchy and possibly unworkable in certain processes without prior warning.

Deductions on the basis of the copper experiments must of course be accepted with reservations and for this reason the Department has, during the period under review, put in hand and collected samples from a long term fernspray dusting experiment at Dartonfield and invited (Leaflet No.C/56/1) Agency Houses to require Estates using fernspray to submit samples of the latex rubbers and scraps from dusted and control areas to R.R.I.C. for examination. In most, but not all, cases the samples were drawn from the dusted areas for upto three to four tappings after each dusting; but, unfortunately, relatively few Estates submitted the control samples requested. Limited attempts have been made to develop a direct method of analysis for the estimation of the extent of contamination: theoretically, the simplest procedure, under our present conditions, would probably be a determination of the total iron content of the samples, similar to the method used to detect appreciable contamination with copper, but it is doubtful whether this method can necessarily be expected to be of much value in particular in the case of scraps, as (a) the proportion of iron in 4 per cent fernspray is not high and as (b) the iron content of scraps drawn from undusted areas is neither invariably very low nor consistent from sample to sample. Available facilities and time did not permit any protracted attempts to develop any procedures involving analysis for the 'dithiocarbamate' part of the fungicide and an indirect procedure, *e.g.* T.C.R. test, has been employed to give a preliminary indication of gross contamination. The results, exclusive of a small number of fraction crepe samples, are summarized in the table below:—

Drawn from (Field Treatment)	No. of Samples	% Classification According to Producers' Marking Limits				
		Outside Red	Red	Yellow	Blue	Outside Blue
Control Areas ...	121	13.2	26.5	40.5	19.8	0.0
Dusted Areas ...	523	13.2	30.8	33.8	20.1	2.1

As the data in both rows of the table include an appreciable number of latex blanket crepe samples, which in Ceylon frequently give high strain values in the T.C.R. test procedure, undue importance should probably not be attached (in this connection) to the relatively high proportion of samples classified as outside red, although this could imply that appreciable contamination with a fungicide which is a marked retarder of vulcanisation might be undesirable at least in certain cases. At the other end of the table it will be noted that a

significant proportion of the samples drawn from the dusted areas have to be classified as outside blue. All the samples concerned came from a single Estate in a wet district and as this Estate did not furnish an adequate number of control samples it is, perhaps, appropriate, pending more detailed examination, to assume that appreciable undesirable contamination of the latex rubbers may have taken place.

It is understood that the Plant Pathologist does not consider 4 per cent ferspray dust to be as satisfactory, in terms of leaf retention, as 4 per cent or 6 per cent copper dusts and, while it is therefore unlikely that ferspray dust will be used on a large scale, at least in a 4 per cent composition, in 1957, it is perhaps necessary to summarize the Department's present *tentative* views *vis-à-vis* contamination of rubbers. Thus, if it can be assumed that (a) behaviour in the A.C.S.1 formulation is an adequate guide to behaviour in other formulations and that (b) the degree of contamination likely to be encountered under normal commercial conditions is insufficient to have a serious effect on properties which cannot be correlated with or related to scorch and strain value, then it is at present questionable whether the Department would be justified in recommending the discontinuance of further *small scale tests* with 4 per cent ferspray dust, provided the dust is not employed (except with special precautions) on Estates whose latex rubbers are normally of low strain value in the T.C.R. test and provided any first fraction crepes are specially examined before sale. Further attention will be given to various aspects of this subject in 1957.

REPORT OF THE SMALLHOLDINGS DEPARTMENT

By

R. T. Wijewantha

SUMMARY

Mr. R. T. Wijewantha, B.Sc. (Hons) London, was appointed Smallholdings Propaganda Officer in July, 1956, and took charge of the Smallholdings Department on 1-10-56 vice Mr. W. I. Pieris, B.A. (Cantab).

One Rubber Instructor retired from service and two left the Department. Routine transfers affecting two Assistant Propaganda Officers and six Range Officers were ordered. Loans were made available to six Departmental officers to purchase motor vehicles.

The Smallholdings Department cadre was increased by 2 District Field Officers and 6 temporary Rubber Instructors.

Replanted smallholdings were found to be infected to a fair degree by Fomes (White Root Disease) and a complete survey was commenced.

Rubber Instructors conducted 450 sheet-making demonstrations and sold 508 sq. ft. of mesh for strainers and 175 aluminium latex pans at concession rates. 30 Demonstration and 18 private smokehouses were constructed. 208 samples of acid were tested. Rubber Instructors paid 3362 advisory visits to smokehouses and 691 to Rubber Commissioner's depots.

The Latex Corporation of Ceylon factory at Katukurunda closed down at the end of the year and consequently the two smallholders latex centres had to be wound up. 65 advisory visits were paid by the field staff to these two centres.

234 tapping, 286 disease control and 520 miscellaneous demonstrations were also given by the field officers.

The Chairman of the Rubber Research Board inspected sulphur-dusting at Kosgama on 3rd February. The Director inspected the work of the Department in Kegalla and Avissawella in May and June.

A detailed 5-Year Plan on sulphur dusting as an Island-Wide Scheme and a 5-Year Plan on the requirements of the Smallholdings Department with regard to staff and equipment were submitted.

Coloured advisory leaflets on White Root Disease, Pink Disease and Bark Cracking in PB 86 were published both in English and Sinhalese. These form the first three issues of a new series meant particularly for small owners and containing condensed information and precise instructions.

4728 replanting permits covering 7846 acres of smallholdings were issued by the Rubber Controller in 1956. During the year Rubber Instructors lined

4839 acres for planting holes and 3804 acres for soil conservation work. 143 random inspections of planting material issued from the Rubber Commissioner's depots to subsidy replanters revealed that the plants were on the whole satisfactory except for a few cases where planting material had been supplied by certain private commercial nurseries.

4720 preliminary reports on the suitability of lands for growing Rubber were forwarded to the Rubber Controller after inspection and report by Rubber Instructors. 4696 peasant and middle-class new-planting permits covering 7329 acres were issued by the Rubber Controller in 1956. Rubber Instructors lined 1335 acres in 939 holdings for holes and 1285 acres in 1009 holdings for soil conservation work. 11035 record sheets maintained in respect of newly planted holdings were forwarded to the Rubber Controller at his request to enable 'registration' of these lands.

127,585 clonal seedlings were issued free to peasant class new-planters and 19,873 sold at concession rates to middle-class new planters. Rs. 9,500/80 was paid to peasant class new-planters as soil conservation grants.

A practical and economic scheme for sulphur dusting of smallholdings was formulated by this Department in 1955. This scheme was tried out in early 1956 and was an unqualified success. A total of 1632½ acres in 315 smallholdings were dusted. In all, 16 co-operative groups functioned. The work progressed successfully in all groups, and marked beneficial results were obtained. A detailed report is available at the Head Office at Dartonfield as a R.R.I. Circulation Paper No. 1950 of 27-6-56.

On the basis of the 1955/56 trial, a 5-Year Plan was drawn up and submitted for consideration by the Government. According to this scheme the acreage to be dusted would be increased in stages so that at the end of the 5th year almost the entire extent of economic Rubber smallholdings in the Island would be sulphur dusted against *Oidium*. It was suggested that for the year 1956/57 (1st year) 30 sulphur dusting groups representing all Rubber growing areas in the Island should be formed. The proposed scheme was advertised in the Press and by a leaflet in English and Sinhalese in October 1956. The response from the smallholders was encouraging and the requisite number of dusting groups were organised before the dusting season commenced.

DETAILED REPORT

1. INTRODUCTION :

Mr. R. T. Wijewantha, B.Sc. (Hons) London, was appointed Smallholdings Propaganda Officer in July, 1956, and took charge of the Smallholdings Department on 1-10-56 on the retirement of Mr. W. I. Pieris B.A. (Cantab) after 26 years of service in the Rubber Research Institute of Ceylon. Mr. W. I. Pieris held the post of Smallholdings Propaganda Officer since the inception of this Department.

Mr. W. A. de Silva, Rubber Instructor, Kesbewa, retired on 31-1-56. Mr. de Silva joined the New Rubber Planting Scheme in 1939 and came to us in 1948 when the administration of the New Rubber Planting Scheme was taken over by the Rubber Research Institute of Ceylon. Mr. L. D. Thambugala, Temporary Rubber Instructor joined the Department on 1-8-55 and left on 25-4-56 having secured other employment. Mr. C. Wickremanayake, Temporary Rubber Instructor, Baddegama, left this Department on 31-8-56.

Mr. H. H. Peiris, Assistant Propaganda Officer North was transferred to the Southern Sector and Mr. K. Wilson de Silva, Assistant Propaganda Officer South to the Northern Sector as from 1-10-56. Routine transfers affecting 6 range officers were ordered in the course of the year under review.

2. GENERAL :

Establishment.—It was considered necessary to strengthen the field staff by the recruitment of an additional 6 temporary Rubber Instructors, as the present staff of this Department was found to be quite inadequate to cope with the ever increasing volume of work in new-plantings and subsidy replantings. The Rubber Replanting Subsidy Scheme kindly consented to meet the cost of this additional staff.

With this increase in staff, the total approved field strength would be 6 District Field Officers, 46 Rubber Instructors (36 permanent and 10 temporary) and 2 Replanting Assistants. The Rubber Instructors' Ranges will consequently be re-demarcated shortly, and increased to 40. The extra Rubber Instructors will be shifted about as and when necessary to relieve the pressure of work in the busier ranges.

White Root Disease.—A fairly high incidence of Fomes (*Leptoporus*) lignosus in smallholdings was noticed by the author on his visits to the various Ranges. It was observed that over 10 per cent of all replanted subsidy holdings were infected to some degree or the other. The attention of the Chairman, Rubber Replanting Advisory Board was drawn to this matter, and he was requested to stress in his future advisory circulars to prospective subsidy replanters, the necessity to remove as many of the old lateral roots as possible before replanting. It was also decided to issue a short and simple Departmental leaflet on 'White Root Disease.' As the preliminary enumeration on the incidence of Fomes was found to be insufficient, it was decided to obtain a clearer picture of the position by means of a complete survey. A special form was drawn up and Rubber Instructors were requested to record the necessary information on all subsidy areas planted between 1953-1956. This survey will be completed in 1957.

Conference.—A staff Conference where all Assistant Propaganda Officers and District Field Officers were present, was held at this office on 8-10-56 to discuss matters relating to the general administration of the Department. The Conference proved to be of considerable value as various problems about which officers were in doubt were discussed and clarified.

Sheet Improvement.—Rubber Instructors conducted 450 sheet-making demonstrations for the benefit of smallholders. 508 sq. ft. of mesh for strainers and 175 aluminium latex pans were sold at concession rates. 30 demonstration and 18 private smoke-houses were constructed. 208 samples of acid were tested. Instructors paid 3362 advisory visits to smokehouses and 691 visits to Rubber Commissioner's depots.

Latex Centres.—65 advisory visits were paid by field staff to Latex Centres, all of which ceased functioning at the end of the year as a result of the closing down of the Latex Corporation of Ceylon factory at Katukurunda.

Demonstrations.—In addition to the sheet-making and sulphur dusting demonstrations mentioned earlier, 234 tapping, 286 disease control, and 520 miscellaneous demonstrations were given by the field officers.

Loans.—Loans for the purchase of motor vehicles were given to 6 Departmental officers.

Correspondence.—A measure of the heavy field and advisory work in which this Department is engaged can be judged from the volume of correspondence.

General:	Inward	3,529
	Outward	7,289

With Rubber Controller	Inward	2,983
	Outward	5,313

Visits.—The Chairman of the Rubber Research Board inspected sulphur dusting at Kosgama on February 3rd. The Director inspected the work of the Department in the Kegalla and Avissawella areas in May and June and expressed satisfaction at the progress made.

Memoranda.—At the request of the Director, a detailed 5-Year Plan on Sulphur Dusting as an Island-Wide Scheme, and a 5-Year Plan on the requirements of the Smallholdings Department with regard to staff and equipment, were submitted.

A detailed report on the 1955/56 Sulphur-Dusting Trial is available at the Head Office at Dartonfield as a R.R.I. Circulation Paper No. 1950 of 27-6-56.

3. PUBLICATIONS :

The following advisory leaflets were issued both in English and Sinhalese:—

1. White Root Disease of Rubber—Fomes (*Leptoporus*) *lignosus*.
2. Pink Disease of Rubber—*Corticium salmonicolor*.
3. Bark Cracking in PB.86.

The above leaflets form the first 3 folders of a new series meant particularly for smallholders. The manner of presentation of information on subjects of interest to small-owners has been completely changed. The leaflets are simpler and more striking and the information contained therein has also been condensed. The leaflets were printed in red, brown and green respectively. Simplified coloured leaflets on other topics of interest will be issued in due course.

Revised versions of the earlier Smallholdings Leaflets on Budding, Replanting, Smoking and Sheet-making, Tapping and Rubber Production, will also be published subsequently.

4. RUBBER REPLANTING SUBSIDY SCHEME :

The field staff were heavily worked throughout the year, and all necessary assistance given to enable smallholders to replant their lands in accordance with the requirements of the subsidy scheme.

The following replanting permits were issued by the Rubber Controller for 1956:—

	<i>No. Permits</i>	<i>Extent</i>		
		A.	P.	R.
Estates over 100 acres ...	380	10,762	—0—	20
Estates between 10 and 100 acres ...	1,012	7,978	—2—	29
Smallholdings under 10 acres ...	4,728	7,846	—2—	21
		<hr/> <hr/>		
		26,587	—1—	30

Copies of all permits issued, were received from the Rubber Controller and forwarded to the Rubber Instructor of the area concerned for necessary action. These officers are required to pay preliminary advisory visits in the first instance, followed by subsequent visits as and when necessary. All such visits and the work done or advice given has to be recorded in a sheet provided for this purpose in respect of each smallholding.

During the year, Rubber Instructors lined 4,839 acres on 3,036 holdings for planting holes, and 3,804 acres on 2,417 holdings for soil-conservation work.

In view of the annually increasing quantity of replanting work falling on the Rubber Instructors, it was decided by the Rubber Replanting Advisory Board in June 1956 that Instructors need not pay routine visits to subsidy holdings after planting is completed, except at the special request of an owner. This decision was reversed in December 1956 on the suggestion of the Smallholdings Propaganda Officer who reported a deterioration in the standard of maintenance of smallholdings since subsequent visits were done away with, and also on account of the observed incidence of White Root disease in many permit-areas.

A letter of appreciation was received from the Chairman, Rubber Replanting Advisory Board, regarding the useful work done by this Department on behalf of the Rubber Replanting Subsidy Scheme.

A number of complaints made to the Rubber Controller regarding the poor quality and high casualties of plants issued by him to subsidy replanters from certain nurseries were received for investigation. Reports were forwarded on each holding after an inspection of the plants by a Rubber Instructor. In some cases it was apparent that plants from certain private nurseries did not conform to the minimum standards of growth and preparation laid down by the Rubber Controller, and in others it was difficult to ascertain the actual cause of the high casualties owing to the delay by the smallholders to make their complaints.

It was therefore considered desirable for some responsible officer to inspect the planting material before issue; and at the request of the Rubber Replanting Advisory Board, officers of this Department carried out random checks on the planting material issued from the Rubber Commissioner's Depots. For this purpose detailed instructions were sent to all Rubber Instructors explaining the method of testing the viability of planting material and checking of plants and bundles at random. 143 random visits were made by the range officers and a total of 21,556 plants examined. The planting material issued was on the whole satisfactory. All cases of unsatisfactory planting material were brought to the notice of the Depot Officers immediately and later formal reports were forwarded to the Rubber Controller for necessary action.

5. NEW-PLANTING OF RUBBER:

One of the most important functions of this Department is in regard to advisory work connected with new rubber plantings. Planting of new areas in Rubber is permitted only on the authority of the Rubber Controller. Before permits are issued, the Range Rubber Instructor inspects the area to be planted and reports on the suitability of the land for growing Rubber. 4,720 such preliminary reports were forwarded to the Rubber Controller. 4,696 peasant and middle-class permits covering 7,329 acres were issued in 1956.

Instructors lined 1,335 acres in 939 holdings for planting holes and 1,285 acres in 1,009 holdings for soil conservation work.

11,035 record sheets maintained in respect of newly planted holdings were forwarded to the Rubber Controller at his request to enable him to "register" these lands.

Planting Material.—Suitable clonal seedlings are issued by this Department to peasant and middle-class owners of new-planting permits. Peasant class permit-holders are issued planting material free of charge while middle class owners are provided with clonal seedlings at subsidised rates.

The following quantities of seedlings were issued from the Agricultural Department nurseries in 1956:—

<i>Source</i>	<i>Free to Peasants</i>	<i>Sales to Middle-Class Permit-Holders</i>	<i>Total</i>
Mapalana ...	13,943	3,600	17,543
Horana ...	26,029	3,552	29,581
Walpita ...	14,140	1,125	15,265
Wagolla ...	14,269	1,271	15,540
Peradeniya ...	13,084	2,300	15,384
Karapincha ...	35,940	4,900	40,840
Labuduwa ...	10,180	3,125	13,305
	127,585	19,873	147,458

It was estimated that about 175,000 clonal seedlings would be required for issue in 1957. The Director of Agriculture was informed of our requirements to enable him to establish a sufficient number of nurseries in time. According to the information available at the moment it would appear that we would be supplied with only about 120,000 clonal seedlings. The Director of Agriculture was therefore again addressed on this subject, and suggestions made regarding the establishment of more nurseries in early January 1957 to meet our balance requirements.

Soil Conservation.—This Department continued to pay peasant class new-planters a soil conservation grant (at approved rates). In all, a sum of Rs. 9,500.80 was paid. The actual amount of the grant to an owner depends on the amount of work done. Such work has to be in accordance with the instructions of the Smallholdings Propaganda Officer.

Aid to Peasant Class New Rubber Planters.—At a recent Conference at the Rubber Controller's office it was agreed that the financial assistance given to peasant class permit holders was inadequate, and it was also considered that in future, assistance should be confined to the following:—

1. A higher grant for soil conservation work.
2. Issue of planting material free of charge.
3. Issue of fertilisers at subsidised rates.

Such a scheme of assistance, if approved by Government, would come into effect from 1958.

6. OIDIUM :

Oidium control by sulphur dusting is practised in most large and medium size estates. In smallholdings however the position had been rather unsatisfactory as small owners cannot afford to purchase dusting machines and organise themselves unaided into suitable co-operative groups.

A practical and economic dusting scheme was formulated by this Department in 1955. This scheme was tried out in early 1956 and was an unqualified success.

On the basis of the 1955/56 trial, a 5-Year Plan was drawn up and submitted for consideration by the Government. According to this scheme the acreage to be dusted was to be increased in stages so that at the end of the 5th year almost the entire extent of economic Rubber smallholdings in the Island would be sulphur dusted against *Oidium*. It was suggested that in the dusting year 1956/57 the area to be dusted should be extended to include Rubber holdings representative of all Rubber growing areas in the Island. The number of dusting machines to be used would be about the double the number made available in 1955/56.

1955/56. Dusting Trial.—Dusting was done in 16 “groups” of holdings situated in the main Rubber Districts. 315 holdings comprising 1,632½ acres were dusted. Dusting operations commenced on 24-12-55 and continued till 25-2-56. Each holding was given a minimum of 5 dustings at weekly intervals and at the rate of 12 lbs. of sulphur dust per acre per dusting. So that in all about 60 lbs. sulphur was required to dust one acre.

Dusting was carried out by the “groups”,—whose personnel were previously trained by this Department,—under the supervision and guidance of the local Rubber Instructor. The work progressed satisfactorily in all dusting groups and marked beneficial results were obtained. The over-all average cost of the treatment excluding the cost of machines and Departmental supervision worked out at Rs. 17/97 per acre.

Much time and energy of all staff were expended on this important work. The success of this scheme is in no small measure due to the enthusiasm and hard work done by the Rubber Instructors and supervisory field staff who were entrusted with this work. This entailed regular work often commencing at 4 a.m. or earlier for several weeks.

1956/57 Island-Wide Sulphur Dusting Scheme.—Following the satisfactory results of dusting in previous years the Government decided to offer extended facilities to smallholders in 1957 on the basis of the scheme formulated by this Department and described earlier. 15 more dusting machines (making a total of 33) were placed at the disposal of the Smallholdings Propaganda Officer.

The proposed scheme was advertised in the press and by a leaflet in English and Sinhalese, in October. Applications were received from a number of newly formed groups representative of all Rubber Districts. It was decided to confine the scheme to 30 dusting groups. The spare 3 dusting machines were to be handed over to District Field Officers as stand-by machines. The Dusting Scheme in 1956/57 will be on practically identical lines as in the previous trial year.

The District Field Officers and Rubber Instructors were requested to keep a careful watch on “wintering” and to forward weekly reports to this office. The group in the Talangama Range was the earliest to require selective treatment, and dusting was commenced here on 20th December.

In view of the acute shortage of sulphur this year various adjustments have had to be made to cope with the scarcity. Most dusting groups to commence with, were issued with only half their requirements of sulphur. These groups as well as the groups with late defoliation will be issued the balance sulphur when fresh stocks arrive in 1957.

REPORT OF THE ESTATE DEPARTMENT

By

L. Wijeyegunawardena

SUMMARY

Dartonfield Group.—The total planted acreage of Dartonfield, Nivitigalakele and Hedigalla Divisions was approximately 1010 acres by the end of the year, and of this total acreage 323 acres were in tapping.

Climatic conditions were not unfavourable for harvesting of crop. There was a marked decrease in the rainfall this season when compared with the previous year. The 1st quarter of the year recorded the lowest rainfall for the past five years.

A very satisfactory crop was harvested for the season amounting to 205,161 lbs. and representing a yield of 635 lbs. per acre on the tapped area. Seventy per cent of the crop was manufactured in the form of crepe and thirty per cent as Ribbed smoked sheet.

The immature rubber in the group now stands at 673½ acres of which 60 acres of new clearing were planted in the South-west and North-east planting seasons this year at Hedigalla Division.

Top buddings with *Dothidella* olei-resistant clones were carried out at Hedigalla. Budwood was obtained for this purpose from Multiplication Nurseries on the Nivitigalakele Division where the budwood of these clones obtained from the Rubber Research Institute of Malaya was established.

Budwood of the RRIC series of clones continued to be much in demand. The issue of budwood to Estates and smallholdings was attended to by the Estate Department.

The control of *Oidium heveae* presented no difficulties this season. Control measures adopted were effective and resulted in an even healthy refoliation. *Phytophthora* leaf fall was more marked when compared with the previous season but there being no large acreages of any one clone susceptible to *Phytophthora*, the leaf fall was confined to pockets in the Group.

Routine control measures were adopted with regard to root diseases, which were mainly confined to a few young replantings and new plantings in the Group.

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

The Rubber Replanting Subsidy Scheme Nursery at Egaloya continued to be looked after throughout 1956. This nursery is in full production.

Approximately 2½ lakhs of PB.86 budded stumps and 3¼ lakhs of Tjir.1 seedlings were issued from this nursery during the year. Fifty two acres of nursery were opened up on Hedigalla Division in 1956 to augment supplies of planting material, and the nursery being extended by a further twenty five acres. The Rubber Research Institute of Ceylon has to date opened up and planted 139 acres of nursery for the Rubber Replanting Subsidy Scheme.

Estimates for 1957 for Dartonfield Group were prepared by the writer and submitted to the Rubber Research Board. In connection with the Hedigalla Nursery an estimate for 1957 was drawn up and submitted to the Rubber Replanting Advisory Board.

DETAILED REPORT

Visiting Agent.—The Visiting Agent, Mr. C. A. C. Bowen, paid two visits to the Institute's properties during the year. Reports on these visits were submitted to the Rubber Research Board.

Superintendent.—The writer was on duty throughout the year.

Staff.—Subject to the following changes and additions, the Department's staff remained same.

Dartonfield.—Mr. H. M. Buultjens who had been acting as Nursery Manager of the R.R.S.S. Nursery at Egaloya resumed duty as Chief Field Assistant Dartonfield Division on 1st January, 1956. Mr. J. Pitchamuthu, Senior Field Assistant, was transferred to Hedigalla.

Hedigalla.—Mr. J. Pitchamuthu took up duty as Senior Field Assistant in Division 2. One Assistant Engine Driver from Dartonfield was posted to run the 20 H.P. Gardner Engine, which was removed from Dartonfield and installed there. Two new appointments of Field Attendants were made on 1st June and 1st September.

The total strength of the Estate Department monthly paid staff stands at 44, made up as follows:—

Senior Staff	...	1
Assistant Staff	...	18
Minor Staff	...	25

Acreeage Summary—Dartonfield Group:

<i>Rubber</i>	<i>Dartonfield</i>	<i>Nivitigalakele</i>	<i>Hedigalla</i>	<i>Total</i>
Mature ...	54-0-23	132-1-19	136-3-36	323-1-38
Immature ...	92-1-38	24-0-08	556-2-31	673-0-37
Nurseries ...	0-3-32	13-1-04		14-0-36
Total rubber ...	147-2-13	169-2-31	693-2-27	1,010-3-31
Building sites ...	23-0-37	1-0-28	8-0-34	32-2-19
Pinewood plantation			1-0-34	1-0-34
Roads ...	6-2-22	0-3-27	9-0-04	16-2-13
Swampy areas ...	0-3-05	0-2-08	0-2-20	1-3-33
Streams and Reser- vations ...	0-0-29		13-0-29	13-1-18
Jungles etc. ...		1-3-38	412-2-04	414-2-02
Total ...	178-1-26	174-1-12	1,138-1-32	1,491-0-30

The cultivated acreage of the Group stands at 1,010-3-31 as against 946-1-11 in 1955. The increase is due to the New Planting at Hedigalla in 1956. The acreage in full bearing increased from 288-3-00 to 323-1-38 in 1956.

Weather.—(Estate Gauge) Dartonfield Rainfall figures for 1952-1956 are shown below:

Month	1952 <i>ins.</i>	1953 <i>ins.</i>	1954 <i>ins.</i>	1955 <i>ins.</i>	1956 <i>ins.</i>	Quinquennial average 1952-1956
January ...	5.03	3.75	11.66	7.63	5.42	6.70
February ...	8.40	5.12	9.62	13.96	3.10	8.04
March ...	6.63	15.21	17.46	13.66	7.87	12.16
April ...	11.69	10.10	17.13	11.75	25.04	15.14
May ...	18.00	4.96	30.10	32.23	16.50	20.36
June ...	13.69	6.79	6.47	23.09	16.45	13.30
July ...	2.50	34.69	8.55	13.89	2.77	12.48
August ...	6.92	6.67	9.78	2.87	13.04	7.85
September...	8.70	8.87	10.54	20.78	12.60	12.30
October ...	19.08	24.28	28.66	21.20	18.58	22.36
November ...	12.30	15.17	10.76	22.11	18.48	15.76
December ...	16.01	11.93	19.32	6.26	11.87	13.08
	<u>128.95</u>	<u>147.54</u>	<u>180.05</u>	<u>189.43</u>	<u>151.72</u>	<u>159.53</u>

Total No. of Wet days 1956 172
 " " " " " 1955 210

Rainfall for the year amounting to 151.72 inches spread over 172 days in the year fell short of the quinquennial average by 7.81 inches. April was an exceptionally wet month with a fall of 25.04 inches and July registered 2.77 inches which is far below the average rainfall for that month.

Crop.—A most satisfactory crop, as shown below, was secured for the season and it exceeded the estimate by 21,101 lbs.

	1956	1955
Estimate ...	184,060 lbs.	171,150 lbs.
Harvested ...	*208,754 "	181,792 "
Excess ...	24,694 "	10,642 "

*This includes 3,593 lbs. received from other estates as test tapping biscuits. The actual amount harvested therefore is 205,161 lbs.

Dartonfield	Acreage in tapping	Comparative yield records of individual fields			
		Total yield in lbs.		Yield per acre	
		1956	1955	1956	1955
1934 Replanted Area	7½	5,009	6,112	667.8	814.9
1936 " "	9½	6,935	7,274	730.0	765.7
1938 " "	19½	13,432	14,769	688.8	757.4
1939 " "	2	1,230	1,431	615.0	715.5
1941 " "	6½	4,849	4,590	746.0	706.2
1947 " "	10¼	8,078	7,635	788.1	744.9
	<u>55¼</u>	<u>39,533</u>	<u>41,811</u>	<u>715.5</u>	<u>756.8</u>

Comparative yield records of individual fields

	Acreage in tapping	Total yield in lbs.		Yield per acre	
		1956	1955	1956	1955

Nivitigalakele					
1926 Replanted Area	13	8,365	10,167	643.4	782.1
1927 " "	10	6,000	8,128	600.0	812.8
1928 " "	15 $\frac{3}{4}$	7,580	11,326	481.2	719.1
1935 " "	28 $\frac{1}{2}$	18,033	17,969	632.7	630.5
1939 " "	10 $\frac{1}{2}$	9,119	9,000	889.6	878.1
1940 " "	9 $\frac{3}{4}$	8,919	7,784	914.7	798.4
1940 (Swamp Area)	3 $\frac{1}{4}$	3,046	2,869	937.2	882.8
1941 Clearing	7	8,503	7,781	1,214.7	1,111.6
1942 " "	5	4,696	4,229	939.2	845.8
1943 " "	3	2,737	1,873	912.3	624.3
1944 " "	4 $\frac{1}{2}$	4,080	3,517	906.5	781.6
1946 Replanted Area	21	26,530	15,253	1,262.3	726.3
	131	107,608	99,896	821.4	762.6
Hedigalla					
1943 Clearing	10 $\frac{1}{4}$	9,205	8,099	898.0	790.2
1944 " "	11 $\frac{3}{4}$	8,982	7,716	764.6	656.7
1945 " "	22 $\frac{1}{4}$	11,509	8,118	517.2	364.9
1946 " "	12 $\frac{3}{4}$	9,831	6,393	771.1	501.4
1947 " "	45	13,452	9,759	298.9	216.9
1949 " "	34 $\frac{3}{4}$	5,041	—	145.1	—
	136 $\frac{3}{4}$	58,020	40,085	424.3	393.0
Total for the Group	323	205,161	181,792	635.2	630.7
T.T. Biscuits from outside estates		3,593	3,625		
	323	208,754	185,417		

Tapping.—(a) Tapping was stopped on 5th February for resting during refoliation and was resumed on 5th 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 cumulative effect of *Phytophthora* leaf fall for the past two years. Satisfactory control of *Phytophthora* was achieved by dusting with Copper Sandoz.

Analysis of tapping rounds for 1956 (1955 figures in brackets)

		<i>Early tapping</i>	<i>Late tapping</i>	<i>Resting</i>	<i>No tapping</i>	
					<i>Rain</i>	<i>Holidays</i>
1st Quarter	...	47 (44)	4 (15)	30 (28)	— (2)	— (2)
2nd " "	...	50 (46)	20 (20)	— —	25 (26)	6 (2)
3rd " "	...	57 (58)	29 (18)	— —	6 (9)	— —
4th " "	...	56 (60)	26 (16)	— —	10 (14)	— (3)
		210 (208)	79 (69)	30 (28)	41 (51)	6 (7)

Manufacture:

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

<i>Latex Grades</i>		<i>Total in lb.</i>	<i>Percentage</i>
Smoked Sheets No. 1	... ..	59,283	28.40
" " No. 2	... ..	1,329	.64
" " No. 3	... ..	140	.07
Pale Crepe No. 1	... ..	74,961	35.91
" " No. 2	... ..	19,879	9.52
" " No. 3	... ..	9,951	4.76
Latex for experiments	... ..	2,042	.98
		<hr/>	<hr/>
		167,585	80.28
		<hr/>	<hr/>
<i>Scrap Grades</i>			
Scrap Crepe No. 1	... ..	33,052	15.83
" " No. 2	... ..	6,931	3.32
" " No. 3	... ..	340	.16
Scrap for experiments	... ..	846	.41
		<hr/>	<hr/>
		41,169	19.72*
		<hr/>	<hr/>
Grand Total	... ..	208,754	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.

Estates Roads and Paths.—All roads, paths and steps were maintained in good condition throughout the year.

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

Weeding.—Mature rubber areas in tapping were well weeded and maintained clean and tidy.

Pests and Diseases:

Oidium Heveae.—Weather conditions, being particularly dry during the first two months of the season, caused early wintering of trees and considerably inhibited the activity of Oidium. Sulphur dusting operations were carried out successfully resulting in an even healthy refoliation.

Phytophthora Palmivora.—The incidence of Phytophthora was mainly confined to the 7½ acre block at Dartonfield, which was dusted using Copper Sandoz. There was more damage this year than in previous years on the two outlying Divisions of Nivitigalakele and Hedigalla. The spread of the disease was localised as there were no large areas of any one susceptible clone. The results of the attack, at Dartonfield Division particularly, were reflected in the yields.

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.

Root Diseases.—**Fomes (Leptoporus) lignosus, Utsulina Zonata etc.**—A few scattered cases of these diseases were found on the mature areas and routine measures of control were adopted. Details of loss of trees due to various causes were given in the monthly reports of this Department.

Wind Damage.—Severe wind damage was recorded in April at Nivitigalakele Division. Approximately 5 acres of the 1928 clearing in full bearing were lost. It is intended to convert this area into a Budwood Nursery to accommodate the best of the RRIC series clones.

Capital Account—Agricultural Development:

Dartonfield Division—Immature Replanted Area

1950/51 Replanted Area	—	25 $\frac{3}{4}$ acres
1952	”	34 $\frac{1}{4}$ ”
1953	”	16 $\frac{1}{2}$ ”
1954	”	7 $\frac{3}{4}$ ”
1955/56	”	4 $\frac{3}{4}$ ”
		89

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

Pests and Diseases.—The 1952 and 1953 clearings sustained losses of 22 and 17 trees respectively due to Fomes (Leptoporus) lignosus. 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.

1950/51 Replanted Area—25 $\frac{3}{4}$ acres.—The growth of plants in this clearing is quite satisfactory and is due for tapping in 1957.

1952 Replanted Area—34 $\frac{1}{4}$ acres.—Crown Budding.—This field carries 50 per cent of the area with top-buddings of LCB 870 on PB 86, NAB 12, 15 and 20 and RRIC 501. There appears to be a general set back in growth of the centre section of approximately 2 years on top-budded trees.

1953 Replanted Area (Clone Museum).—Two-thirds of this area was completely replanted with RRIC material in 1956. The balance area which formed part of the original clone museum was supplied with stumped buddings.

1955/56 Replanted Area 4 $\frac{3}{4}$ acres.—This area was planted with five clones—GT 1, WR 101, AV 385, AV 427 and RRIC 52 and are coming on well.

Nivitigalakele Division—Immature Areas.—

1943 (Replanted in 1950/51)	—	4 acres
1953 Clearing	—	10 ”
1954 ”	—	10 ”
		24

Routine weeding, cultivation and other agricultural operations were carried out and the clearings maintained clean and tidy.

Hedigalla Division—Immature Areas:

1950/51 Clearing	—	20	acres
1952	”	79½	”
1953	”	142	”
1954	”	177½	”
1955	”	78	”
1956 (Part)	”	60	”
		<hr/>	
		557	”
		<hr/>	

1952 Clearing—79½ acres.—A block of PR 107 was top budded with Dothidella-Resistant clones: FX. 25, 232, 360, 636, 652, 664, 714, 2784, 4037, F. 351, 409, 1619, 1638, FB. 3300 and 3363.

Routine weeding, cultivation and other agricultural operations were carried out in these clearings.

Trees Uprooted:

Dartonfield	Mature Areas	1950/51 Clg.	1952 Clg.	1953 Clg.	1954 Clg.	1955 Clg.
Fomes (Leptoporus)						
lignosus	20	3	22	17	11	—
Ustulina Zonata	2	—	1	—	—	—
Brown Bast	5	—	1	—	—	—
Wind Damage	31	2	11	—	—	—
Brown Root (Fomes Noxius)	1	—	—	—	—	—
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	59	5	35	17	11	
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Nivitigalakele	Mature Areas	1950/51 Clg.	1952 Clg.	1953 Clg.	1954 Clg.	1955 Clg.
Fomes (Leptoporus)						
Lignosus	5	—	—	1	8	
Ustulina Zonata	17	—	—	—	—	
Brown Bast	7	—	—	—	—	
Wind Damage	536	—	—	—	—	
Bleeding Canker	2	—	—	—	—	
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	567			1	8	
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Hedigalla						
Fomes (Leptoporus)						
lignosus	3	1	18	47	49	5
Brown Root (Fomes Noxius)	1	2	15	12	1	1
Wind Damage	16	—	1	—	—	—
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	20	3	34	59	50	6
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

1956 Clearing—60 acres.—Seventy one acres were felled, burnt and cleared by end of April for the layout of a large-scale clone trial. In this section only approximately 40 acres were found to be plantable due to slab rock. This area was divided into two areas of approximately 20 acres each, the division being across the contour as far as the terrain permitted; one half was holed 12' × 20' giving 180 points per acre. The spacing for the second half was 8' × 30'. This was done with a view to compare square planting with the avenue system. To compensate for the loss of 20 acres a further section was opened up in the area scheduled for planting in 1957 and the planting distances dealt with in a similar manner.

The first area was planted during the South-West Monsoon using eighteen clones: RRIC 54, 55, 59; RRIM 603, 605, 612, 617, 618; IRCI 5, 9; PR 228, 247, 252, 253, 258; AVROS 1191 and PB 86. The 20-acre area was planted during the North-East Monsoon with 11 clones: RRIC 39, 42, 48; IRCI 6, 13; PR 256, 1406; AVROS 1320, 1447 and 1851.

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

NURSERIES:

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

Seedling Nursery—Dartonfield 1 acre.—An acre of seedling nursery was opened and planted with 46,600 Tjir. 1 seedlings.

Budding and Attention.—13,000 Budded Stumps were prepared at the Nivitigalakele Nurseries for the new planting in 1956 at Hedigalla.

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

Budwood Nurseries—Nivitigalakele.

Dothidella-resistant clones.—87 points of 12 different clones were established in May.

Elimination and Establishment of Clones.—In August a dozen of the unimportant clones were uprooted from the nurseries and a total of 331 points were established as follows:

Eighty-one points of RRIC 52 and twenty-five points each of GT 1, AVROS 247, WR 101, AVROS 285, RRIC 82 & RRIC 85. In September/October, a further 100 points were established of clones LCB 1320, RRIC 28 and RRIC 77.

Budwood Distribution.—Budwood of various clones was sold to estates and smallholdings. Budwood was also obtained from the Nivitigalakele nurseries for the Institute's requirements.

FIELD AND FACTORY EXPERIMENTS

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

LABOUR AND HEALTH

Labour was settled and adequate for work done this year. Line room accommodation was satisfactory. Wages were paid during the year in accordance with the Wages Boards Ordinance in force.

DARTONFIELD GROUP:

<i>Working Ceylonese</i>	<i>Resident</i>	<i>Non-resident</i>	<i>Total</i>
Men	110	138	248
Women	73	84	157
Children	15	17	32
 <i>Working Immigrants</i>			
Men	33	—	33
Women	22	—	22
Children	4	—	4
Grand Total	257	239	496

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

Maternity Benefits.—8 full maternity benefits and 9 medical wants benefits payments were made.

Feeding Children and Milk Foods.—Free rations and $\frac{1}{4}$ lb. of bread were issued to each non-working child. Milk foods were issued to all infants whose mothers were incapable of nursing them.

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

Anti-Mosquito Measures.—DDT/Gammexane spraying was carried out throughout the year at regular intervals, in and around the bungalows and lines under the supervision of the Apothecary.

Births.—17 children were born during the year on the Group.

Deaths.—There were two 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.

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

Influenza	...	...	542
Ulcers	...	...	123
Anchylostomiasis	...	...	102
Other intestinal parasites	...	...	100
Other diseases	...	...	1,592
Total	...	...	2,459

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.

Cottages.—All cottages within the Group were maintained in good condition. At Hedigalla extensive repairs were effected on roofs of cottages found to be leaking badly. In addition, the water facilities were improved and a new dam built providing uninterrupted supply of pipe-borne water.

Water & 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.—A Peugeot Station Wagon was purchased early in the year making a total of six vehicles. A metal detachable hood was fitted to the Land Rover. The Vanguard Station Wagon which was almost irreparable, was traded in for a second-hand vehicle of the same make.

Machinery.—Messrs. H. W. Hammond & Co., Consulting Engineers visited the Institute on 9th and 10th February, 1956, 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 80/90 B.H.P. National Engine at Dartonfield was fitted with a new big end bearings and was completely overhauled.

Fuel Consumption:

	<i>Average per hour</i>
80/90 <i>B.H.P. National Engine</i>	
Liquid Fuel	2.36 gallons
Lubricating Oil	.25 ,,
40 <i>B.H.P. Lister Engine</i>	
Auto Diesel	1.36 gallons
Lubricating Oil	.12 ,,
240 <i>B.H.P. Blackstone Engine</i>	
Liquid Fuel	3.36 gallons
Lubricating Oil	.50 ,,
20 <i>B.H.P. Gardner Engine (Hedigalla)</i>	
Liquid Fuel	.75 gallons
Lubricating Oil	.06 ,,
5 <i>B.H.P. National Engine (Nivitigalakele)</i>	
Liquid Fuel	.75 gallons
Lubricating Oil	.08 ,,

Factory Machinery.—There were no additions to the factory machinery. All machinery were maintained in good order.

Drying Loft.—A C.C.C. 48" axial flow propeller type fan was installed. An asbestos partition forming a small single suction chamber was constructed. The object of this set up being to ensure even distribution of the air throughout the drying loft, resulting in fairly even drying of laces. Four different fan spreads are obtainable by changing the position of the driving belt as cone pulleys were fitted to the fan shaft and counter shafts. This is now in operation.

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

Smoke-House:

Direct fired Air Heater.—The 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 Myres pump driven by 5 B.H.P. motor were maintained in good order.

(b) The 4" × 3" double acting Horizontal Lee Howel Pump driven by a 5 B.H.P. motor functioned satisfactorily.

(c) The Walker & Grieg pump driven by a 2 B.H.P. motor worked satisfactorily.

Machinery and Laboratories.—All electrical machinery in the Laboratories were tested by the Visiting Engineer and defects were attended to by the Institute's Electrician.

NEW BUILDINGS ETC.—CAPITAL ACCOUNT

Water and Power Supply—Hedigalla.—Work connected with the overhead power lines was completed early in the year. Water supply was augmented by installing an overhead tank and a hand pump.

Green-house.—Work connected with renovations and improvements to the Greenhouse was abandoned.

Store for Chemicals.—A store was constructed in accordance with the requirements of the Agronomist.

Six Double Cottages at Hedigalla.—Work in progress.

Colassing $\frac{1}{2}$ mile of Road at Dartonfield.—Completed.

Two-roomed Building for Manure and Sulphur at Hedigalla.—Completed.

Eradicating Coffee Plantation at Hedigalla.—Completed.

Power Supply—Dartonfield.—Supplementary provision was made to augment the power supply by installing two additional cables—one paralleling the existing cable feeding the laboratories to accommodate a new Autoclave and the other to feed Senior Staff Bungalows Nos. 1 and 2 (Director's and Chemist's). Orders for these were placed with Messrs. Brown & Co., Ltd., and they are in communication with their Principals in U.K. about supplies.

Fans and Tats for Bungalows.—On supplementary provision made in the mid year, the following facilities were provided to Senior and Intermediate Staff Bungalows:—

2 ceiling fans for each Senior Staff Bungalow.

1 ceiling fan for each Intermediate Staff Bungalow.

1 ceiling fan for Agronomy Department.

Bamboo tats for verandahs of Senior and Intermediate Staff Bungalows.

RUBBER REPLANTING

SUBSIDY SCHEME NURSERIES AT EGALOYA AND HEDIGALLA

Egaloya Nursery:

The Egaloya nursery opened up by the Institute in May, 1953, continued to be looked after throughout 1956. This nursery will be taken over by the Rubber Control Department in 1957.

Superintendence.—The Estate Superintendent, R.R.I.C., paid supervisory visits to the nurseries weekly.

Acreage Statement:

Seedling Rubber Nurseries	...	...	82	2	35
Budwood Nurseries	...	...	4	1	28
Coconut	...	...	1	0	07
Paddy	...	...	4	3	05
Roads	...	...	0	3	37
			<hr/>	<hr/>	<hr/>
			93	3	32

Rainfall.—A rainfall of 146.03 inches with 196 wet days was recorded as against 191.07 inches in the previous year.

Planting Material.—(a) *Budded Stumps*—Two large-scale budding programmes were completed for the S.W. and N.E. planting seasons.

109,672 PB 86 budded stumps were issued for the S.W. and

134,892 PB 86 budded stumps were issued for the N.E.

(b) *Tjir 1 seedlings.*—

108,103 seedlings were issued for the S.W. and

171,707 seedlings for the N.E.

Visits.—Members of the Rubber Replanting Advisory Board visited this nursery on the 8th February, 1956.

Hedigalla Nursery:

This Nursery consists of two sections, and work on these commenced simultaneously in January, 1956.

Section 1.—An area of approximately 30 acres was selected in the 1955-56 clearings planted in the avenue system 8' × 30' as recommended by the Visiting Agent.

Planting beds were lined along the avenues (in between two rows of plants 30 feet apart) leaving a distance of seven feet on either side of the plants so that there would be the minimum interference with the budded stumps in the early years of growth, and also allowing for sunlight and good circulation of air in both the clearing and the nursery beds. By mid April approximately 30 acres of new clearing was covered with an effective planting nursery bed area of approximately 20 acres.

Section 2.—The uprooting of forest trees by Estate labour using Monkey Grubbers was taken in hand in January and approximately 5 acres were done. Subsequently contracts for uprooting, burning and clearing were entered into and an acreage of 32 was completed and made ready for planting during the N.E. planting season.

Progress of work up to end of March was comparatively slow due, primarily, to the scarcity of labour. This was, however, counteracted by engaging the services of a lorry for transport of labour from Agalawatta areas. A lorry was later provided by the Rubber Controller for the purpose of transporting labour.

Work is in progress on a further 25 acres of forest land to be made ready for planting under nursery during the next seed season.

Rainfall.—168.78 inches with 229 wet days was recorded during the year.

Planting Material.—It is envisaged that this nursery holding approximately a million Tjir. 1 seedlings could supply appreciable quantities of planting material for the S.W. and N.E. plantings in 1957.

Buildings, Roads and Bridges.—The following works were completed during the year:—

- (a) An Asst. Staff Bungalow for the Nursery Manager.
- (b) Approach Road—Metalling and Tarring of one and three-eighth miles of road.
- (c) A 20-ft. span concrete bridge.

Visits.—The Rubber Replanting Advisory Board visited the Nurseries on 8th February and 27th June, and reported favourably on the progress made.

GENERAL

Correspondence:

Inward	...	1,135
Outward	...	1,642

Estimates.—(a) Estimates for 1957 Capital and Revenue Expenditure in respect of Dartonfield Group were prepared and submitted by the writer to the Rubber Research Board.

(b) Estimates for 1957 Capital and Revenue Expenditure in respect of the Rubber Replanting Subsidy Scheme nurseries at Hedigalla were prepared and submitted by the writer to the Rubber Replanting Advisory Board.

REPORT OF THE CHAIRMAN, RUBBER RESEARCH BOARD

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

Mr. G. H. Carter resumed membership on return from leave with effect from 1st January relieving Mr. H. Cole-Bowen who had acted for him.

Dr. A. W. R. Joachim, Director of Agriculture, resumed membership on return from leave with effect from 10th January relieving Dr. W. R. C. Paul, Acting Director of Agriculture, who had acted for him.

Major T. F. Jayawardena, M.P., ceased to be a member with effect from 18th February on dissolution of Parliament, and Mr. V. T. G. Karunaratne, M.P., was nominated to represent the House of Representatives for a period of three years with effect from 15th June in his place.

Dr. W. R. C. Paul, Acting Director of Agriculture, replaced Dr. A. W. R. Joachim, Director of Agriculture, who retired with effect from 18th August.

Mr. H. S. Amarasinghe, Acting Deputy Secretary to the Treasury, replaced Mr. R. H. Wickremasinghe, with effect from 1st September.

Mr. R. C. L. Notley acted for Mr. G. H. Dulling as representative of the Planters' Association of Ceylon from 18th August to 27th December.

Dr. M. F. Chandraratne, on his assumption of duties as Director of Agriculture, replaced Dr. W. R. C. Paul with effect from 7th December.

Dr. E. D. C. Baptiste, who assumed duties as Director on 19th February, replaced Mr. C. A. de Silva, Acting Director, with effect from that date.

The personnel of the Board at the end of 1956 was as follows:—

Ex-Officio Members:—

The Director, R.R.I.C.—Dr. E. D. C. Baptiste, Ph.D. (Lond.), M.Sc.,
A.R.C.S., D.I.C., F.I.R.I.

The Director of Agriculture—Dr. M. F. Chandraratne, M.B.E., Ph.D.,
B.Sc. (Lond.), D.I.C., F.A.Sc.

The Acting Deputy Secretary to the Treasury—Mr. H. S. Amarasinghe,
C.C.S., B.A. (Lond.).

The Rubber Controller—B. Mahadeva, M.A., C.C.S.

Nominated Members:—

Representing the Senate—Senator Thomas Amarasinghe, O.B.E.

Representing the House of Representatives—Mr. V. T. G. Karunaratne,
M.P.

Representing the Smallholders—Mr. W. P. H. Dias, J.P.

Representing the Planters' Association of Ceylon—Mr. G. H. Dulling and Mr. G. H. Carter.

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

Meetings of the Board were held on 28th February, 19th March, 21st May, 14th August, 22nd October and 19th December.

Committees:—

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

Mr. G. H. Carter resumed membership on return from leave, relieving Mr. H. Cole-Bowen who had acted for him.

Dr. A. W. R. Joachim resumed membership on return from leave, relieving Dr. W. R. C. Paul who had acted for him.

Mr. R. C. L. Notley served on the Committee during the absence of Mr. G. H. Dulling, on leave.

Dr. M. F. Chandraratne, Director of Agriculture, was nominated to serve on the Committee on the retirement of Dr. A. W. R. Joachim.

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

Mr. S. Pathmanathan (Chairman)

Mr. G. H. Carter

Dr. M. F. Chandraratne

Mr. W. P. H. Dias

Mr. B. Mahadeva

Mr. G. H. Dulling

Dr. E. D. C. Baptiste (Director)

Meetings of the Committee were held on 28th February, 28th April, 28th September, 8th October and 30th November.

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

Mr. S. Pathmanathan (Chairman)

Mr. W. P. H. Dias

Dr. E. D. C. Baptiste (Director)

A meeting of the Committee was held on 21st September.

Ad hoc Committees:—

Committee to consider the training of Temporary Supervisors and Overseers for the Land Commissioner's Department.—A Committee consisting of the Chairman of the Board, the Director, Dr. A. W. R. Joachim, Mr. B. Mahadeva, and Mr. W. P. H. Dias, was appointed to consider the training of Temporary Supervisors and Overseers for the Land Commissioner's Department. A meeting of this Committee was held on 15th March.

Selection Committee.—A Committee consisting of Mr. S. Pathmanathan (Chairman), Dr. E. D. C. Baptiste, Mr. W. P. H. Dias, Dr. A. W. R. Joachim and Mr. B. Mahadeva, was appointed to consider the applications for the post of Smallholdings Propaganda Officer and make a recommendation to the Board. Meetings of the Committee were held on 15th March and 11th April and five selected applicants were interviewed on the latter date.

Salaries Committee.—A Committee consisting of the Chairman of the Board, the Director, Mr. G. H. Carter and Mr. B. Mahadeva was appointed to review the salary scales for new entrants to the Institute's staff. Meetings of the Committee were held on 15th May and 21st September.

Committee to consider the Five Year Programme of the Institute.—A Committee consisting of Mr. G. H. Carter, Mr. B. Mahadeva and Dr. E. D. C. Baptiste, considered the Five Year Programme prepared by the Director at a meeting held on 28th November.

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.

On the retirement of Dr. S. P. Wiltshire from the Directorship of the Commonwealth Mycological Institute and from membership of the London Advisory Committee, the Board decided to place on record its deep appreciation of the valuable services rendered by him during his long period of membership of the Committee. The Board also welcomed his successor Dr. J. C. F. Hopkins.

FINANCE

Income.—The Board's main income was derived from the cess on exports of rubber under Section 6(1)a of the Rubber Research Ordinance (Cap. 302). Income from this source was less than the estimate for the year by Rs. 52,757/-.

Monthly cess collections were as follows:—

			Brought Forward	Rs.	492,533
January	...	Rs. 102,328	July	...	150,977
February	...	65,483	August	...	62,780
March	...	50,359	September	...	129,427
April	...	143,599	October	...	37,957
May	...	20,215	November	...	29,377
June	...	110,549	December	...	152,891
Carried Forward	Rs.	492,533	Total	Rs.	1,055,942

A profit of Rs. 80,116 was derived from the normal working of Dartonfield Group, and a grant of Rs. 238,713 was received from Government for Smallholdings work.

Expenditure.—Recurrent expenditure amounted to Rs. 1,393,496.

Capital expenditure amounting to Rs. 433,770 was incurred during the year, the main items being:

Agricultural Development	...	Rs.	259,119
Buildings	...	,,	45,346
Machinery	...	,,	31,972
Laboratory Apparatus	...	,,	66,907
Motor Vehicles	...	,,	18,590

Accounts.—The accounts for the year with a Balance Sheet showing the property and liabilities of the Board have been prepared and will be submitted to the Auditor General for examination.

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

AUDITORS' REPORT FOR 1955.

Ford, Rhodes, Thornton & Co.

P. O. Box No. 186,
Colombo,
5th November, 1956.

The Administrative Secretary,
Rubber Research Institute of Ceylon,
Research Laboratories,
Dartonfield,
AGALAWATTA.

RUBBER RESEARCH INSTITUTE OF CEYLON.

Accounts for the year ended 31st December, 1955.

Dear Sir,

We have pleasure in sending you the Balance Sheet of the Institute as at 31st December, 1955, the Income and Expenditure account for the year ended on that date and various other connected accounts and schedules. We also set out here certain matters regarding the lay-out of the accounts and explanations of items included therein together with notes of various matters which have come to our notice during the course of the audit.

BALANCE SHEET

The balance sheet has been modelled in the same style as that of the Tea Research Institute.

In order to indicate on the balance sheet that part of the funds of the Institute have been expended on fixed assets we have shown the allocation of the Accumulated Fund on the balance sheet as follows:—

Expended on fixed assets	...	Rs.	3,988,344.82
Unexpended fund	...	„	2,147,494.17
Total of accumulated fund	...	Rs.	<u>6,135,838.99</u>

We have altered the position of the 'Surplus' or 'Accumulated Fund' account placing it first on the 'liabilities' side of the balance sheet so that current assets and current liabilities are readily comparable on the face of the accounts.

Subsequent to the dates of acquiring the fixed assets depreciation to the extent of Rs. 610,961/40 has been recovered out of revenue and we have not transferred this amount from the expended section to the unexpended section of the Accumulated Fund account, as in our opinion this is not available for expenditure on additional assets but should be earmarked to replace the assets already in the possession of the Institute.

Further, in order to eliminate unnecessary detail we have only shown the totals of the assets and liabilities under their appropriate heading.

For the same reason we have also shown only the principal headings in the Income and Expenditure account and have attached schedules showing the detail of the main accounts.

We have grouped the various assets held by the Superintendent with the other assets and not shown the balance as owing from the Superintendent as has been the practice in the past.

We would mention that the form in which the accounts are presented is a matter for the Board to decide and our suggested changes are subject to the Board's wishes.

Accumulated Fund:

The Accumulated Fund account has been charged with the special Provident Fund contribution of Rs. 10,555/57 paid to a retiring employee and has been credited with the over-provision of Passage Fund Reserve of Rs. 5,317/87.

Provident Fund:

The Working account of the Provident Fund is shown on schedule 6. We believe that the only investment earmarked for this fund is Rs. 5,000/- 3% Ceylon War Loan 1956/60 and we suggest that a larger proportion of the investments should be held in the name of the Provident Fund and shown as such on the balance sheet. Rule 4 (1) of the Provident Fund rules entitles members to interest at 4½% per annum but most of the investments held receive only 3% interest and therefore a proportion of the interest paid comes out of the ordinary revenue of the estate. We suggest that in future the Secretary obtains from the members confirmation of the balances of their accounts at the end of the year.

Medical Fund:

Although the rules of the fund do not require it we suggest that in future the members confirm in writing their balances at the end of the year.

Provision for furlough pay and passage:

The balance originally shown on this provision was in excess of requirements and we have therefore made the following adjustments:—

- (i) The cost of Dr. Riggenbach's passage was incorrectly charged to staff travelling expenses and Rs. 5,561/33 has now been charged against this provision.
- (ii) Cancelled the transfer of Rs. 15,000/- made during the year.
- (iii) Reduced the provision to Rs. 12,000/- by transferring Rs. 5,317/87 to the Accumulated Fund account.

The final position of the provision for furlough pay and passage is as under:—

Balance as at 31st December, 1954 ...		Rs.	33,967.27
<i>Less:</i> Payments during the year—			
D. H. Constable—passage for self and family to London and deposit for return ...	Rs.	5,995.00	
Dr. H. E. Young—passage for self and family to Brisbane ...	„	5,093.07	
Dr. A. Riggenbach—passage for self and wife from Zurich to Colombo ...	„	5,561.33	
			Rs. 16,649.40
			Rs. 17,317.87
<i>Less:</i> Transferred to Accumulated Fund account ...			„ 5,317.87
			Rs. 12,000.00

We estimate that the provision is Rs. 428/- more than required. The furlough salaries for Dr. Young and Mr. Constable have been charged to Personal Emoluments but in future such salaries should be debited against the provision for furlough pay and passage.

It has been the practice in the past to credit the reserve with round sums such as Rs. 15,000/-. This is incorrect and can easily result in having a provision which does not bear any resemblance to actual requirements. The estimated cost of furlough salary and passage should be taken for each person entitled thereto and the amount spread equally over the active portion of the contract.

Creditors:

In several instances charges have been made in the Income and Expenditure account although the goods and services were not received until 1956. We have made the following adjustments to correct the position:—

Voucher No.	Payee	Details	Account credited	Amount	
283	May & Baker	Chloride	Laboratory equipment & working expenses	13.00	
323	Goodyear Tyre & Rubber Co.	Pliofilm	—do.—	234.65	
376	Imperial Chemical Industries	Valcafor S.D.C.	—do.—	50.75	
—	A. Gallenkamp	Laboratory apparatus	—do.—	700.00	998.40
314	Electric Equipment	Electrical goods	Laboratory apparatus		20.20
315	Dodwell & Co., Ltd.	Roneo cabinet	Stationery and Office equipment		511.70
331	Fernando. Furnishing House	Furniture	Furniture and Fixed Equipment	1,067.50	
362	—do.—	—do.—	—do.—	1,265.00	
333	M. C. Abdul Rahim	Alladin lamps	—do.—	160.00	
348	Hunter & Co.	Hardware supplies	—do.—	104.50	2,597.00
„	—do.—	—do.—	Maintenance of bungalows	23.03	
356	A. D. A. Samaranayake	Brass casement	—do.—	3.60	26.63
373	Walker Sons & Co., Ltd.	Air Chamber part	Maintenance of power and water supply		93.55
528	Ceylon Government Railway	Travelling warrants	Travelling expenses of staff		107.45
Total debited to sundry creditors ...				Rs.	<u>4,354.93</u>

The creditors as shown on the balance sheet presented to us have been increased by including the balance of the checkroll for December. Although payment took place on 7th January, 1955, the payment had been entered as at 31st December, 1955, which is obviously an incorrect practice as the books do not show the true position at the end of the year.

We have also included the balances on Fines Account (Rs. 22/50) and Firewood Account (Rs. 3/91) with the creditors.

Investments:

At their meeting on 17th January, 1955, the Board decided that the investments should be shown on the balance sheet at cost price. This resolution has not been put into effect and the investments are still shown at nominal value.

Fixed Assets:

Details of capital expenditure during the year are given on schedule 7 attached.

Fixed asset registers giving the details of the date, purchases, cost and depreciation have not been kept and should be introduced as soon as possible.

In many cases the insured value of the asset is considerably below the book value.

Latrines costing Rs. 1,829/23 collapsed during the year. As the loss was not due to fair wear and tear it has been debited to Income and Expenditure account and the replacement treated as a new asset.

Sundry Debtors:

Considerable difficulty has been experienced in arriving at the true position of debtors because of numerous errors in the books. We have obtained from all debtors who had not paid their accounts by 10th July, 1956, certificates agreeing the balance owing by them. The amount due from the Rubber Controller has also been agreed by him.

A difference was found between the Dartonfield Group Advance Account in the Head Office books and the Head Office Account in the Dartonfield books. It appears that the difference has been accumulating for over three years. In order to complete the audit this balance has been left in Debtors General but we have included it in the provision for bad and doubtful debts. We ask that when the final accounts for the year 1956 are being prepared—

- (a) the head office books and the estate books agree, and
- (b) debtors are included at the correct figures.

The recovery of certain debts appeared to be very doubtful and we have therefore made a provision for them as discussed.

We have not seen any confirmation of balances from employees who have loans to purchase vehicles. We suggest that this should be obtained in future years.

Cash:

Our assistant counted the cash held by the senior accounts clerk of the Institute and the Estate Superintendent on the morning of Thursday, 12th June, 1956. The amount of Rs. 441/08 held by the senior accounts clerk agreed with the petty cash book balance. The balance shown in the estate cash book was Rs. 4,121/62 but only Rs. 4,040/51 was counted making a difference of Rs. 81/11. The Superintendent explained that an assistant had

been sent to a division to pay the labourers who had not been paid on pay day. At the same time the undermentioned labourers came from the estate and collected their pay from the Superintendent. Chits to the Superintendent from his assistants on the division asking him to pay the labourers were seen.

Publis Samarasinghe	...	Rs.	10.08
D. V. Rhikan	...	"	5.04
E. A. Harris	...	"	22.80
N. Pabilis Silva	...	"	22.84
U. D. Silva	...	"	20.32
		Rs.	<u>81.08</u>

Confirmation could not be obtained from the checkroll as this had been taken to the division. It was noted that the full amount of the checkroll had been entered in the cash book as having been paid although in fact this was not so.

We have increased the balance in Savings Deposit at the Bank of Ceylon by Rs. 48/64 being the accrued interest to 31st December, 1955, which was previously grouped with interest accrued on government securities.

Other Stocks:

There is an entry in the Suspense account in the estate books for the purchase of 2 (40 × 6) galvanised iron sheets and 3 asbestos cement boards with cost, including carriage, Rs. 196/20. Apparently the estate staff disclaim responsibility for this purchase and consequently it does not appear in the stock book. We have included it with Other Stocks.

Included in the stock books is 193 cwt. bags of sulphur valued at Rs. 10,943/98. Stocks should be valued at the lower of cost or market price and as we understand that the price of sulphur at the end of 1955 was approximately Rs. 450/- per ton we have, with the Director's permission, written the stock down to Rs. 4,342/50.

No financial stock record has been kept of such purchases as chemicals for the Institute and they are written off as purchased.

Cash at Bank:

A cheque was issued to N. L. D. Ruban on 1st September, 1955, for Rs. 137/88. At the time of the audit this cheque had not been presented to the Bank. The matter has been discussed with the accounts clerk who is to write the cheque back in 1956. In some cases uncredited bankings date back to early December. Every effort should be made to get income banked as soon as possible.

INCOME AND EXPENDITURE ACCOUNT

We have regrouped certain expenditure so as to follow the form of the Tea Research Institute accounts.

Rubber Cess:

Cess is collected by the Customs and handed over to the Institute. We are unable to verify whether the correct amount due has, in fact, been received.

When comparing figures of rubber exported in the year as given by the Chamber of Commerce there appears to be an overpayment of Rs. 35,353/24 for the year. We have informed the Director of this position.

Interest:

Included in this item is Rs. 755/92 for interest on car loans to officers. The interest is arrived at by calculating the total interest for the whole period of the loan on the reducing balance and then spreading it equally over the period. This method does not give the true interest on the money on loan during the year but as several of these loans are two or three years old it would be too complicated to adjust.

Miscellaneous Receipts:

During the year this account has been used as a Suspense account and many entries have been made which are not receipts. The account includes Rs. 44/69 received from Dr. Risdon which should have been credited to his personal account. The sale of an electric radiant for Rs. 235/69 is also included. The payment of Mr. Constable's income tax of Rs. 275/60 is incorrectly charged in this account instead of his personal account. We consider that rents received should be shown in a separate account. Also credited to this heading is an amount of Rs. 287/56 (representing the excess of two debtors' confirmations over the book value of the debts) pending posting to the correct heading.

ESTATE BOOKS OF ACCOUNT

In our letter dated 20th July, 1955, to the Administrative Secretary we have made a number of recommendations on the estate books of account. The Board decided to bring these recommendations into effect from 1st January, 1956, and we examined the progress made when visiting the estate for the audit.

1. Cash and Bank books:

A new book has been obtained which conforms to our recommended ruling. As the rubber stamp designed to show the persons entering, checking, and approving the entries was not obtained until June, we could not tell whether the checking had in fact been done. The bank reconciliation is prepared each month and initialled by the Superintendent. We have been informed that the cash is checked regularly but no indication of this is given in the cash book. We repeat that the composition of the cash balance should be written in the cash book and signed by the Superintendent to the effect that he has checked the cash and found it correct.

A receipt book with duplicate pages was started on 13th June.

On page 3 paragraph (g) of our letter we recommended that green ink should be used in the checkroll column to distinguish a payment on account of the previous month from a payment on account of the current month. It appears that the senior accounts clerk did not understand this paragraph and our assistant explained the requirements on his visit. We understand that the method will be used from July.

With reference to the petty cash books we note that the cash book ruling is not suitable for this purpose and that expenditure will continue to pass through the journal.

The Superintendent has not been initialling the cash book when he pays or receives the cash or cheque concerned. He has stated that he does not have time to do this but we have pointed out that he has to check the entry at some time and it is usually quicker to do this at the time it arises than wait until the end of the month. We would add that if an error occurs it should be found and corrected immediately.

2. Journal:

A new style journal has been obtained which, although differing from our recommendations, appears to be adequate. In other respects our recommendations have been implemented with the following exceptions:—

- (a) The journal has not been signed by the persons writing and checking or the Superintendent as approving.
- (b) Each entry in the journal has not been initialled by the Superintendent when he has satisfied himself that it is correct.
- (c) It is still the practice to journalise stock but we understand that the system of stock control is being revised.

3. Ledger:

The ledger procedure is still unsatisfactory in the following ways:—

- (a) The Superintendent does not initial the balances when he checks them with the trial balance.
- (b) It appears that sections (c) and (h) on page 6 of our letter have not been understood by the senior accounts clerk. We would mention here that although we found this clerk eager to please it was very difficult to get him to understand the various changes which we have proposed. We understand that separate checkrolls accounts will be opened for each month as from June.
- (c) Sundry creditors and debtors are still shown in one ledger account and separate accounts for each creditor and debtor are to be opened as from June.

4. Quantity Stock Book:

We understand that some difficulty has arisen in obtaining a suitable quantity stock book. We have loaned to the Superintendent our specimen rulings as printed by the Mortlake Press and a new book is to be ordered.

5. Rubber Book (Crop book):

Little action has been taken regarding section 5 of page 8 of our letter, and we suggest that further consideration be given to the adequacy of the existing rubber book.

6. Checkroll:

Although a new checkroll with revised ruling has been obtained we do not consider it satisfactory. Excess ratings and excess rating pay are not shown in separate columns and there are no columns recording the amount "Paid before pay day," "Date" and "Unpaid wages." The columns for sundry and tapping days are not subdivided into "men", "Women," "children" and "total" and there is no column for "Grand total days."

Sections (a), (b) and (c) of our letter are also not in operation.

7. Checkroll amalgamation book:

This book is still not kept and the amalgamation is made on sheets of paper. It was decided after discussion with the senior accounts clerk that he should design suitable rulings for the estate and pass them to us for our consideration. We have not heard from him in this connection.

8. Holiday Pay:

The holiday pay book has been printed for three years and is to be completed in 1956. We understand that the style of register will be changed for 1957.

9. General:

We note that no change has been made in the system of recording and charging lorry expenditure.

As mentioned earlier in this report no inventory of fixed assets showing the cost, date of purchase and major replacements has been maintained.

No change has been made in the system of monthly reports. The items are still shown net where a proportion has been charged to Head Office.

10. Allocation of expenditure as between commercial work and research work:

We understand that this section of our recommendations is to be considered when the revised books have been in operation for some time.

INSTITUTE BOOKS OF ACCOUNT

Cash and Bank book:

- (a) It has been the practice when paying accounts for which credit notes have been received to enter the gross amount in the cash book and to make a separate entry of the credit. This system makes it very difficult to vouch the cheque payments with the bank statement and should be discontinued. The actual amount of the cheque should always be entered in the cash book.
- (b) All cheques should be written in the cash book in number order and we consider that it would be advisable to enter the salary cheques individually thus facilitating the cash book checking.
- (c) When cheques are returned the original entry in the cash book should be cancelled by making an entry on the other side. When another cheque is received or sent a fresh entry should be made. During 1955 no entries were made for the cancelled cheques.
- (d) We understand that the cheque books are kept in a locked drawer and would suggest that they would be safer in the office safe.

2. Journal:

A number of journal entries are made the details of which only appear on slips of paper. We would stress that such details should be entered in the bound book.

Where numerous calculations are required they should be initialled by the Administrative Secretary as having been checked and found correct by him and then filed with other journal vouchers and slips.

3. Ledger:

No personal accounts are maintained in the ledger in respect of sundry sales and the Sundry Receipts account contains several errors. It appears that invoices are made out for goods sold and services rendered, but no entry is made in the books until the cash is received when the transaction is treated as a cash sale. At the end of the year the outstanding balances are entered as Sundry Debtors. A similar system is in operation for sundry purchases. All of these transactions should be entered in the books as and when sales and purchases are made: cash sales should only be treated as such when cash is handed over at the time of sale.

In conclusion we regret that the audit this year has been a protracted affair due to the necessity of correcting a large number of inaccuracies in the books of account. In the case of debtors, while for the purposes of the accounts we have made full provision for debit balances which are uncertain, the books are still not accurate but we have thought it best to issue the accounts on this basis rather than delay further. We would ask, however, that every effort is made to correct this aspect of the book-keeping before the audit for 1956 is commenced.

If there is any matter which is not clear, or if there is any further information we can make available we shall be pleased to do so on hearing from you.

We are, dear Sir,

Yours faithfully,

Sgd. FORD, RHODES, THORNTON & CO.,

RUBBER RESEARCH INSTITUTE OF CEYLON.

Statement No. 1

BALANCE SHEET AS AT 31st DECEMBER, 1955.

LIABILITIES	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.	ASSETS	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.
ACCUMULATED FUNDS:—							FIXED ASSETS:—						
Expended on Fixed Assets					3,988,344.82		Cost						
Unexpended Funds ...							Additions—1955 ...	3,574,511.24					
Balance as at 1st January, 1955 ...	1,163,726.74							415,662.81					
Add: Excess of Income over Expenditure for 1955	409,440.19							3,990,174.05					
Excess requirement of Passage Fund written back ...	5,317.87						Less: Sales and Scrapped in 1955 at cost ...	1,829.23					
Less:—			1,578,484.80				Less: Depreciation Provision—As at 31st December, 1954 ...	508,850.64				3,988,344.82	
Expended on Fixed Assets up to 31st December, 1955 ...		413,833.58					Depreciation—1955 ...	102,528.70					
Reduction in Value of Sulphur Stock ...		6,601.48						611,379.34					
Special Contribution to Provident Fund ...		10,555.57					Less: Depreciation on items scrapped ...	417.94				610,961.40	
			430,990.63									3,377,383.42	
					1,147,494.17		INVESTMENTS AT NOMINAL VALUE:—						
Add: Reserve for Stabilisation of Income ...					1,000,000.00		Ceylon Government Securities					2,863,150.00	
					2,147,494.17		(Approximate Market Value Rs. 2,863,325/-)						
					6,135,838.99								

110

BALANCE SHEET AS AT 31st DECEMBER, 1955.—Contd.

LIABILITIES				ASSETS			
		Rs.	Cts.			Rs.	Cts.
Brought Forward				Brought Forward			
CURRENT LIABILITIES							
Creditors and Provisions—							
Creditors	...	425,581	17				
Assistant Staff Medical Fund	...	34,753	65				
Provident Fund	...	593,862	82				
Provision for Furlough Pay and Passage	...	12,000	00				
		1,066,197.64					
CURRENT ASSETS:—							
				Debtors—General, less provision for bad and doubtful debts		154,158	47
				Debtors and other debit balances		85,443	74
				Deferred Expenditure		38,353	81
				Stocks—			
				Rubber at prices since sold		39,868	63
				Other Stocks		19,501	85
				Cash in hand at Banks		59,370	48
						624,176	71
						961,503	21
		Rs.	7,202,036			Rs.	7,202,036
			63				63

We have examined the above Balance Sheet with the books of The Rubber Research Institute of Ceylon and Dartonfield Group and have obtained all the information and explanations we have required. In our opinion the foregoing Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of affairs of the Institute as at 31st December, 1955, according to the best of our information and explanations given to us and as shown by the books.

Sgd. FORD, RHODES, THORNTON & Co.
Chartered Accountants.

Colombo, 5th November, 1956.

RUBBER RESEARCH INSTITUTE OF CEYLON.

Statement No. 4

SUMMARY OF CREDITORS AS AT 31st DECEMBER, 1955.

	Rs.	Cts.
Sundry Creditors—Estate	...	27,826.52
—do.— Institute	...	69,454.77
Fines account	...	22.50
Firewood account	...	3.91
Receipts in Advance	...	328,273.47
	Rs.	425,581.17

ASSISTANT STAFF MEDICAL FUND AS AT 31st DECEMBER, 1955.

Statement No. 5

		Rate %	Members Rs. cts.	Board Rs. cts.	Forfeitures Rs. cts.	Less Loans Rs. cts.		Total Rs. cts.
Balance as at 31st December, 1954	...	...	13,766.02	13,766.24	4,268.83	152.00		31,649.09
Contributions during the year	...	8	4,882.62	—	—	—		
Board:—								
Headquarters' Staff	...	...	—	3,550.53	—	—		
Estate Staff	...	...	—	1,129.25	—	—		
Rubber Controller:—								
Egaloya Staff	...	...	—	199.00	—	—		
Loans granted during the year	...	15	—	—	—	1,228.20		
Forfeitures (as per contra)	...	...	—	—	297.63	—		
								8,830.83
			18,648.64	18,645.02	4,566.46	1,380.20		40,479.92
Less:—								
Payment of Expenses	...	6	2,853.91	2,853.91	—	—		
Refunds	...	12	297.62	—	—	—		
Forfeitures	...	14	—	297.63	—	—		
Consultations—								
College of Indigenous Medicine	...	15	—	—	102.00	—		
Recovery of Loans	...	...	—	—	—	678.80		
								5,726.27
Balance as at 31st December, 1955	...		Rs. 15,497.11	15,493.48	4,464.46	701.40		34,753.65

113

RUBBER RESEARCH INSTITUTE OF CEYLON.

PROVIDENT FUND AS AT 31st DECEMBER, 1955

	Members	Board	Total
	Rs. cts.	Rs. cts.	Rs. cts.
Balance as at 31st December, 1954	244,345.51	297,229.52	541,575.03
<i>Add:</i> Contributions during the year:—			
Members—Rule 2 (i)	57,823.27	—	
Board Rule 3 (i) Headquarters' Staff	—	52,884.36	
Estate Staff	—	6,217.31	
Rule 3 (ii) —do.—	—	3,020.07	
Rubber Controller—Rule 3 (i) Egaloya Staff	—	966.74	
<i>Add:</i> Interest credited per Rule 4 (i)	11,301.84	12,624.79	
Special Contribution to retired member paid in 1954	—	10,555.57	
			155,393.95
	313,470.62	383,498.36	696,968.98
<i>Less:</i> Payment during year per Rule 5 (iii)	40,620.82	62,485.34	103,106.16
Balance as at 31st December, 1955	272,849.80	321,013.02	593,862.82

RUBBER RESEARCH INSTITUTE OF CEYLON.

Statement No. 7

SUMMARY OF FIXED ASSETS AND VEHICLES AS AT 31st DECEMBER, 1955.

ASSET ACCOUNT

				(Cost at 31-12-54		Additions 1955		Deduct Assets sold or scrapped at Cost		Cost at 31-12-55			
				Rs.	Cts.	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.		
Land Including Development:													
Dartonfield	...	...	...	325,794.		28,354.		—		354,148.			
Nivitigalakelle	...	...	...	189,676.		6,565.		—		196,241.			
Hedigalla	...	...	...	679,020.		203,613.		—		882,633.			
				1,194,490.		238,533.		—		1,433,023.			
Buildings and Lines:													
(Unallocated)													
Dartonfield	Estate	...	...	222,736.		3,268.		1,829.		224,175.			
	Headquarters	...	...	705,030.		53,206.		—		758,237.			
Nivitigalakelle	Estate	...	...	46,924.		200.		—		47,124.			
	Headquarters	...	...	25,112.		—		—		25,112.			
Hedigalla	Estate	...	...	241,261.		29,597.		—		270,858.			
	Headquarters	...	...	21,312.		13,450.		—		34,762.			
				1,262,378.		99,722.		1,829.		1,360,271.			
Machinery and Tools:													
Dartonfield	...	...	...	550,566.		12,695.		—		563,262.			
Nivitigalakelle	...	...	...	4,754.		—		—		4,754.			
Hedigalla	...	...	...	19,427.		—		—		19,427.			
				574,748.		12,695.		—		587,444.			
Motor Vehicles:													
Dartonfield	...	...	...	49,025.		12,416.		—		61,442.			
Furniture and Fixed Equipment:													
Dartonfield	...	...	...	141,899.		9,794.		—		151,693.			
Nivitigalakelle	...	...	...	5,733.		—		—		5,733.			
Hedigalla	...	...	...	2,436.		1,192.		—		3,628.			
				150,069.		10,986.		—		161,055.			
Carried Forward				3,230,711.		374,355.		1,829.		3,603,237.			

SUMMARY OF FIXED ASSETS AND VEHICLES AS AT 31st DECEMBER, 1955 (Contd.)

ASSET ACCOUNT

				Cost at 31-12-54		Additions 1955		Deduct Assets sold or scrapped at Cost		Cost at 31-12-55	
				Rs.	Cts.	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.
Brought Forward				3,230,711.93	...	374,355.13	...	1,829.23	3,603,237.83
Power and Water Supply:											
Dartonfield	155,515.24	10,750.51	—	—	—	166,265.75	
Nivitigalakelle	7,880.48	—	—	—	—	7,880.48	
Hedigalla	16,860.16	3,282.73	—	—	—	20,142.89	
				...	180,255.88	14,033.24	—	—	—	194,289.12	
Laboratory Apparatus											
Laboratory Apparatus				163,543.43	27,274.44	—	—	190,817.87	
GRAND TOTAL				...	Rs. 3,574,511.24	Rs. 415,662.81	Rs. 1,829.23	Rs. 3,988,344.82			

RUBBER RESEARCH INSTITUTE OF CEYLON

Investments held at 31st December, 1955.

Investments at Nominal Value

Ceylon Government Securities:		Rs.	Cts.
Rs. 25,000/-	3½% Ceylon Government loan 1957/62	25,000	
Rs. 20,000/-	3% " " War loan 1956/60	20,000	
Rs. 70,000/-	3½% " " National Loan 1964/69	70,000	
Rs. 750,000/-	Sri Lanka Government Loan 1969/74	750,000	
Rs. 600,000/-	3% Ceylon Government Loan 1973/78	600,000	
Rs. 500,000/-	3% Ceylon Government Loan 1966/71	500,000	
Rs. 500,000/-	3% Ceylon Government Loan 1972/77	500,000	
Rs. 398,150/-	3¼% Ceylon State Mortgage Bank Debentures	398,150	
(Approximate Market Value 2,863,325)		Rs.	<u>2,863,150</u>

Statement No. 9**Summary of Debtors—General**

As at 31st December 1955

	Rs.	Cts.	Rs.	Cts.
Principal Collector of Customs			105,871	03
Dartonfield Estate:				
Staff—Foodstuffs	866	89		
„ Lent Labour	51	52		
„ Club Account	45	39		
„ Firewood	108	50		
Sundry Estate Debtors	13,045	46	14,117	76
Sundry Institute Debtors			40,614	59
			160,603	38
<i>Less:</i> Provision for Bad and Doubtful Debts			6,444	91
			Rs.	<u>154,158.47</u>

Statement No. 10**Summary of Debtors and other Debit Balances**

As at 31st December 1955.

	Rs.	Cts.
Loans to staff for purchase of transport	30,935	66
Payments in Advance	30,877	53
Accrued Interest	23,470	55
Deposits		160.00
	Rs.	<u>85,443.74</u>

Statement No. 11

RUBBER RESEARCH INSTITUTE OF CEYLON

Summary of Deferred Expenditure

As at 31st December, 1955.

					Rs.	Cts.
Hedigalla 1956 Clearing	...	...	...	...	2,000.	00
Nurseries	...	...	...	...	36,353.	81
					<u>Rs.</u>	<u>38,353.81</u>

Statement No. 12

Summary of Stocks as at 31st December, 1955.

					Rs.	Cts.	Rs.	Cts.
Rubber at prices since sold	...	...	...	...			39,868.	63
Other Stocks—Estate								
Foodstuffs	...	...	...	...	978.	85		
Sundry Stores	...	...	...	...	18,523.	00		
							<u>19,501.</u>	<u>85</u>
					<u>Rs.</u>	<u>59,370.</u>	<u>48</u>	

Statement No. 13

Summary of Cash in hand and at Banks

As at 31st December, 1955.

					Rs.	Cts.	Rs.	Cts.
Savings Bank:								
Ceylon Savings Bank	...	...	...	...	4,456.	02		
Bank of Ceylon Savings Account	...	...	...	...	9,776.	89		
							<u>14,232.</u>	<u>91</u>
Current Accounts—Bank of Ceylon:								
Head Office	...	...	...	...	563,138.	44		
Smallholdings General Account	...	...	...	...	900.	00		
Smallholdings Soil Conservation Account	...	...	...	...	1,224.	66		
Estate	...	...	...	...	11,965.	00		
							<u>577,228.</u>	<u>10</u>
Current Account—Westminster Bank Ltd.:								
London Advisory Committee £ 540-14-03	...	...	...	...			7,209.	50
Petty Cash:								
Head Office	...	...	...	...	518.	98		
Smallholdings Department	...	...	...	...	370.	18		
Estate	...	...	...	...	24,558.	73		
London Advisory Committee £ 4-07-05½	...	...	...	...	58.	31		
							<u>25,506.</u>	<u>20</u>
					<u>Rs.</u>	<u>624,176.</u>	<u>71</u>	

RUBBER RESEARCH INSTITUTE OF CEYLON**Details of Expenditure on Revenue Account for
the Year Ended 31st December, 1955.****Administration of the Board**

	Rs.	Cts.
Travelling of the Board	2,671	.50
Entertainment of Board Members		7.94
Secretary's Salary	14,307	.58
Other Office Salaries	29,238	.50
Postages and Telegrams	3,976	.35
Stationery and Office Equipment	6,134	.96
Telephone	1,504	.77
Legal Charges		263.50
Auditor's fees and expenses for audits for 1954 and 1955 and examination of accounting system	9,567	.53
Dearness Allowance	27,710	.28
Contingencies	1,864	.17
Advertisements	7,687	.67
	Rs. 104,934	.75

Senior Scientific Staff

	Rs.	Cts.
Director	44,120	.00
Botanist	21,780	.65
Agronomist	23,837	.50
Chemist	25,469	.35
Plant Pathologist (from 1.12.55)	1,687	.50
Asst. Plant Breeder	1,786	.45
Proportion of Superintendent's salary	6,686	.48
Research Assistant Agronomy Dept.	5,520	.00
Assistant Mycologist and Asst. Plant Breeder	6,452	.97
Technical Assistant to Director	4,818	.06
Research Assistant Chemistry Dept.	4,816	.45
Research Assistant Botany Dept.	4,080	.00
Dearness Allowance	34,069	.51
	Rs. 185,124	.92

Junior Scientific Staff

	Rs.	Cts.
Salaries	42,650	.89
House allowance		616.65
Dearness allowance	35,113	.76
	Rs. 78,381	.30

Statement No. 14 contd.

Laboratory

	Rs.	Cts.
Equipment and General Working Expenses ...	32,004	98
Furniture Replacements		63.08
	<u>Rs.</u>	<u>32,068.06</u>

Statement No. 14 (a)

RUBBER RESEARCH INSTITUTE OF CEYLON.

Details of Expenditure on Revenue Account for
the Year Ended 31st December, 1955.

Library and Publications

	Rs.	Cts.
Library	5,051	35
Publications	14,252	27
	<u>Rs.</u>	<u>19,303.62</u>

Field and Factory Experiments

	Rs.	Cts.
Field Experiments	32,547	78
Factory Experiments	12,705	45
	<u>Rs.</u>	<u>45,253.23</u>

Maintenance of Buildings

	Rs.	Cts.
General Buildings	11,070	01
Bungalows	12,108	05
	<u>Rs.</u>	<u>23,178.06</u>

Miscellaneous

	Rs.	Cts.
Provident Fund	76,810	99
Medical Scheme—Senior Staff	1,406	88
Medical Fund—Assistant Staff	3,550	53
Insurance	9,325	77
Latrines written off	1,411	29
Contribution to London Advisory Committee ...	4,666	66
Contribution to the British Rubber Producers Research Association	150,000	00
Furniture written off	1,079	74
Social Services	961	75
Staff Entertainment Allowance	284	00
	<u>Rs.</u>	<u>249,497.61</u>

Statement No. 14 (a) contd.

Travelling of Staff

	Rs.	Cts.	Rs.	Cts.
Officers Expenses			13,916.	24
Insurance and Car Licences			781.	50
Driver's wages			2,347.	26
Driver's batta			118.	65
Running Expenses and repairs			15,220.	98
Dearness allowance			7,984.	07
Assistant Staff Expenses			5,695.	41
Railway Warrants to Staff			1,799.	17
Sundry Transport Expenses			295.	63
			48,158.	91
<i>Less: Expenses Recovered:—</i>				
Dartonfield Group	6,467.	61		
Egaloya Nursery	3,615.	57		
Other Estate		757.	64	
Transport of Firewood and Budwood		189.	00	
Private Hires		129.	34	
			11,159.	16
			Rs. 36,999.	75

Statement No. 14 (b)

RUBBER RESEARCH INSTITUTE OF CEYLON.

**Details of Expenditure on Revenue Account for
the Year Ended 31st December, 1955.**

Smallholdings Work

	Rs.	Cts.	Rs.	Cts.
Emoluments of Smallholdings Staff:—				
Smallholdings Propaganda Officer			29,113.	41
Other Staff			207,152.	19
Additional Instructors Employed			963.	10
Office Allowance to Field Officers			3,455.	00
Staff Travelling			48,110.	70
Office Rent			3,452.	00
Printing and Stationery			3,216.	08
Advertising			211.	25
Postage			3,178.	14
Telephone, Trunk calls etc.			545.	45
Telephone Deposit			75.	00
Electric Fans and Lamp Shades			1,011.	18
Bicycle			239.	17
Brass Mesh			602.	75
Sundry Repairs and Replacements			245.	10
Sundry Materials			356.	97
Nursery Expenses			195.	31
Free Issues			559.	00
Miscellaneous			471.	36
			303,153.	16

Statement No. 14 (b) contd.

Less: Refund from Rubber Controller:—

Loan of Clerk	...	...	...	2,932.45	
Sulphur Dusting Trial	...	...	...	2,865.80	
Sale of Budded Stumps	...	...	...	1,050.00	
" " Mesh	...	...	...	681.40	
" " Coagulation Pans	...	...	...	345.45	
Sundry sales	...	...	...	132.00	
					<u>8,007.10</u>
					Rs. <u><u>295,146.06</u></u>

Factory Maintenance

					Rs. Cts.
Buildings	...	...	...		1,987.69
Plant etc.	...	...	...		2,269.01
					<u>4,256.70</u>
					Rs. <u><u>4,256.70</u></u>

General Services

					Rs. Cts.
Power and Water Supply	...	...	...		25,862.53
Proportion of Estate Staff Salaries	...	...	...		5,474.27
					<u>31,336.80</u>
					Rs. <u><u>31,336.80</u></u>

ESTIMATES FOR 1957,

(Adopted by the Board, 22nd October, 1956).

Estimate of Income for 1957.

1.	Cess Collections	Rs.	1,108,800
2.	Government Grant for Smallholdings Work	,,	231,500
3.	Interest	,,	80,665
4.	Sale of Publications	,,	4,000
5.	Profit from Dartonfield Group Working	,,	27,179
6.	Sundry Receipts	,,	3,000
		Rs.	1,455,144

Estimate of Expenditure for 1957.

1. Administration of the Board:—

(a)	Travelling expenses of Board Members	Rs.	5,000
(b)	Entertainment of Board Members	,,	250
		Rs.	5,250

2. Personal Emoluments:—

(a)	Senior Scientific Staff	Rs.	174,940
(b)	Junior Scientific Staff	,,	64,031
		Rs.	238,971

3. Library and Publications:—

(a)	Library	Rs.	8,000
(b)	Publications	,,	10,000
		Rs.	18,000

4. Smallholdings Department:—

(a)	Salaries and Allowances	Rs.	271,431
(b)	Travelling and General Expenses	,,	99,390
		Rs.	370,821

5. Laboratory:—

(a)	Equipment and Working Expenses	Rs.	54,800
(b)	Furniture Replacements	,,	600
		Rs.	55,400

6. Field and Factory Experiments:—

(a)	Field Experiments	Rs.	47,220
(b)	Factory Experiments	,,	45,610
		Rs.	92,830

	Brought Forward ...	Rs.	
7. Office:—			
(a) Salaries of Office Staff ...	Rs. 53,018		
(b) Stationery and Office Equipment ...	,, 7,500		
(c) Postages and Telegrams ...	,, 4,500		
(d) Advertising ...	,, 2,500		
(e) Telephone ...	,, 1,700		
(f) Audit ...	,, 4,700		
	<hr/>	Rs.	73,918
8. Travelling Expenses of Staff:—			
Officers' Expenses ...		Rs.	24,000
9. Maintenance Charges:—			
(a) General Buildings ...	Rs. 3,826		
(b) Bungalows ...	,, 11,978		
(c) Water and Power Supply ...	,, 56,283		
(d) Furniture ...	,, 1,500		
(e) Motor Vehicles ...	,, 17,302		
	<hr/>	Rs.	90,889
10. Miscellaneous items shared with Estates:—			
(a) Dartonfield Group General Charges ...	Rs. 15,190		
(b) Upkeep of Building Premises ...	,, 12,922		
(c) Factory Upkeep ...	,, 7,710		
	<hr/>	Rs.	35,822
11. Other Charges:—			
(a) Contribution to London Advisory Committee ...	Rs. 4,800		
(b) Contingencies ...	,, 1,500		
(c) Insurance Charges ...	,, 16,050		
(d) Staff Provident Fund ...	,, 95,200		
(e) Passages ...	,, 15,000		
(f) Entertainment Allowance ...	,, 500		
(g) Dearness Allowance to Staff ...	,, 122,070		
(h) Assistant Staff Medical Fund ...	,, 8,000		
(i) Senior Staff Medical Scheme ...	,, 3,000		
(j) Social Services ...	,, 2,200		
	<hr/>	Rs.	268,320
12. Depreciation ...		Rs.	120,000
13. Renovations and Replacements ...		,,	5,250
14. Establishment and Upkeep of Nurseries ...		,,	34,838
15. Plant Breeder (token vote) ...		,,	1,000
	<hr/>	TOTAL ... Rs.	<u>1,435,309</u>

Capital Expenditure

1. Agricultural Development	...	...	...	...	Rs.	195,342
2. Buildings	...	...	...	...	,,	224,975
3. Water and Power Supply	...	...	...	...	,,	5,275
4. Roads	...	...	...	...	,,	4,950
5. Equipment etc.	...	...	...	...	,,	72,025
6. Miscellaneous	...	...	...	...	,,	11,700
					Rs.	<u>514,267</u>

Summary

Income	...	...	...	...	Rs.	1,455,144
Expenditure:—						
Revenue	...	...	...	Rs.		1,435,309
Capital	...	...	...	,,		<u>514,267</u>
					Rs.	<u>1,949,576</u>
Excess of Expenditure over Income	...				Rs.	<u>494,432</u>

*Printed for the RUBBER RESEARCH INSTITUTE OF CEYLON, Dartonfield, Agalawatte,
by H. W. CAVE & CO., LTD., Fort, Colombo.*