

**THE
RUBBER RESEARCH INSTITUTE OF CEYLON**

ANNUAL REVIEW FOR 1965

C O N T E N T S

	PAGE
DIRECTOR'S REVIEW —by Ronald T. Wijewantha, B.Sc. (Cey.), B.Sc. (Special) Hons. (Lond.), M.Sc. (Lond.), Ph.D. (Calif.), M.Sig.Xi., M.I. Biol. ...	1
BOTANY SECTION —by L. B. Chandrasekera, B.Sc. (Cey.), Dip.Ag.Sci. (Cantab.) ...	13
PLANT BREEDING SECTION —by D. M. Fernando, B.Sc. (Cey.), M.Sc. (Mc-Gill) ...	33
PLANT PATHOLOGY DIVISION —by O. S. Peries, B.Ag.Sci. (Melb.), Ph.D. (Bristol), M.I.Biol.	44
SOILS CHEMISTRY DIVISION —by A. J. Jeevaratnam, B.Sc.Ag. (Cey.), B.Ag.Sc. (Adel.), M.Ag.Sc. (Adel.)	59
RUBBER CHEMISTRY DIVISION —by M. Nadarajah, B.Sc. (Cey.), M.Sc. (Birm.), A.R.I.C.	70
SMALLHOLDINGS DEPARTMENT —by H. H. Peiris	78
ESTATE DEPARTMENT —by L. Wijeyegunawardene	90
R.R.I.C. SUB-STATION, KURUWITA —by B. Cocking	99

RUBBER RESEARCH INSTITUTE OF CEYLON

DIRECTOR'S REVIEW FOR 1965

BY

RONALD T. WIJEWANTHA

GENERAL

The Rubber Research Institute, after a lapse of a considerable number of years held a largely attended conference on rubber at the Savoy Theatre, Colombo on 22nd February 1965. The conference which was declared open by the Hon'ble Minister of Agriculture, Food & Fisheries was a great success. The Heads of the various divisions addressed the representative gathering on recent developments in research in their respective fields. Papers were also presented by the Botanist and the Assistant Plant Pathologist.

Ceylon was chosen as the venue for the first ever liaison meetings on leaf, panel and root diseases sponsored by the International Rubber Research and Development Board. The sessions commenced with a seminar held at the Hotel Taprobane on 24th November 1965 to which representatives of the rubber and allied industries were invited to be present. The seminar which was well attended was opened by Mr. P. C. Imbulana, Junior Minister of Agriculture, Food & Fisheries. The liaison meetings which were held on 25—26th November in Colombo were attended by representatives of the Rubber Research Institutes of Malaya, Viet-Nam, Indo-China, Ivory Coast and Ceylon. The foreign delegates visited the Rubber Research Institute at Dartonfield on 27th November.

The liaison meetings on root diseases and leaf and panel diseases were presided over by Dr. A. Newsam and Dr. O. S. Peries respectively.

The Institute participated in the Ceylon Government Industrial Exhibition which was held in January 1965. The general lay-out of the Institute's stall and the presentation of exhibits were commended by the Board.

Senator S. D. S. Somaratne was nominated by the Hon'ble Minister of Agriculture & Food to represent the Senate on the Rubber Research Board for a period of 3 years effective 1-6-1965 in place of Senator T. P. de Zoysa.

Mr. D. P. Attygalle, M.P., had been nominated by the Hon'ble Minister of Agriculture & Food to represent the House of Representatives on the Board for a period of 3 years with effect from 23-6-1965 in place of Mr. K. D. D. Perera, M.P.

Mr. A. T. M. Silva ceased to be a member of the Board on relinquishing duties as Director of Agriculture and Mr. D. C. L. Amerasinghe, B.A. (Lond.) replaced him with effect from 1-6-1965.

Mr. N. Abeygoonewardena, J.P., smallholders' representative resigned from the Board with effect from 30-6-1965 due to ill-health. Mr. S. Randeny, J.P., was nominated by the Hon'ble Minister of Agriculture & Food to represent the smallholders with effect from 20-11-1965.

Mr. C. A. de Silva, Director, proceeded on 1st November, 1965 on 4 months leave prior to retirement.

Dr. Ronald T. Wijewantha, Head of the Botany Division took over as Acting Director in addition to his own duties with effect from 1st November, 1965. He was also nominated by the Board to replace Mr. C. A. de Silva, as a member of the International Rubber Research and Development Board and of its Standing Committee, with effect from the above date.

Dr. O. S. Peries, Head, Plant Pathology Division, Mr. A. J. Jeevaratnam, Head, Soils Division, Mr. M. Nadarajah, Head, Rubber Chemistry Division, Mr. A. B. Dissanayake, Chief Advisory Officer Smallholdings and Mr. L. Wijeyagunawardena, Estate Superintendent, were on duty during the year.

Mr. M. Nadarajah, Head of the Rubber Chemistry Division and his Senior Technical Assistant, Mr. D. S. Muthukuda visited the Rubber Research Institute of Malaya during the period 1-12-65 to 17-12-65.

Mr. C. D. de Fonseka, Chief Administrative Officer and Secretary to the Board retired from service on 27th January. He was on end of contract leave from 28-1-65 to 27-3-65. At the time of his retirement, Mr. de Fonseka had served the Institute for over 30 years. The Board expressed its appreciation of his services during that period.

Mr. B. C. Moldrich was appointed Chief Administrative Officer and Secretary to the Board with effect from 28th January 1965.

Mr. B. Cocking, Visiting Superintendent, R.R.I.C. Sub-station, Kuruwita continued to oversee the sub-station during 1965.

Mr. L. B. Chandrasekera, Botanist was on duty throughout the year.

Mr. D. M. Fernando, Plant Breeder, was on end of contract leave from 4-10-65 to 4-11-65.

Mr. C. G. Silva, Soils Chemist followed a UNESCO training course in Soil Biology in India in January. He also attended a three week course in Geomorphology conducted by the UNESCO at the University of Ceylon, Peradeniya in September, together with Mr. R. S. John, Assistant Soils Chemist. Mr. John also followed a one month's course on radio-isotope techniques at the Radio-isotope Centre, University of Ceylon in May/June 1965.

Mrs. S. C. Goonetilleke, Librarian and Publications Officer, proceeded on 13th April on a Commonwealth Scholarship for a course of training in documentation at the Documentation Research and Training Centre in Bangalore. Mr. W. Ranasinghe, Library Assistant was in charge of the library and publications work in her absence.

Mr. R. Satchuthananthavale, Assistant Botanist, Mrs. V. Satchuthananthavale, Assistant Plant Pathologist, Mr. S. W. Karunaratne, Assistant Rubber Chemist, and Mr. V. B. Solomon, Assistant Statistician, continued their post-graduate studies abroad.

Messrs. H. H. Peries, Senior Assistant Advisory Officer and K. Wilson de Silva, Assistant Advisory Officer were away on end of contract leave from 1-10-65 to 31-12-65 and 1-7-65 to 30-9-65 respectively.

The following Intermediate Staff Officers were on duty :

1. Mr. D. L. S. Wimalajeewa — Assistant Plant Pathologist
2. Mr. N. Nadarajapillai — Assistant Statistician
3. Mr. P. C. J. F. Keerthisinghe — Works Engineer
4. Mr. D. E. A. Abeywickrema — Assistant Advisory Officer
5. Mr. M. R. T. Mendis — Assistant Estate Superintendent

Mrs. J. Sivabalasunderam, B.Sc. (Madras) was appointed Assistant Rubber Chemist with effect from 1st March 1965.

Assistant Staff changes

Mr. K. D. Julius, Field Assistant, retired from service on 11th February after 30 years of service at the Institute.

Mr. W. S. Benjamin was appointed Building Foreman with effect from 7th June.

Mr. J. W. S. Bulner, Apothecary, resigned on 30th April and he was succeeded by Mr. P. H. A. Perera on 15th July.

The death occurred on 17th August of Mr. M. T. F. Perera, Rubber Instructor.

Mr. S. P. Fernando, Personal Assistant to the Director retired from the Institute's service at the end of July after 28 years of service. He was succeeded by Mr. P. Samarasinghe with effect from 1st September.

Messrs. D. A. Brahakmana and W. T. Silva were promoted Field Assistants with effect from 13th September and 15th September respectively and were attached to the Botany Division.

Mr. S. D. Hidellearachchi was appointed Temporary Rubber Instructor with effect from 15th September.

Mr. A. K. Martin, Field Assistant, assumed duties on 1st October on transfer from the Hedigalla Experimental Station.

Mr. J. B. Rodrigo, Dispenser attached to the Hedigalla Experimental Station, resigned on 16th October.

Mr. H. B. H. de Silva, Senior Field Assistant who was attached to the Institute's Sub-station at Kuruwita, took up duties in the Plant Breeding Section with effect from 1st November.

Mr. M. C. Perera was transferred from the Nivitigalakelle Experimental Station to the Kuruwita Sub-station as Acting Senior Field Assistant with effect from the same date.

Visitors

Visitors to the Institute included the following :—

- Hon. Mr. Fiona Campbell, Hunthill Jeburgh, Scotland.
- Mr. Molly Nayler, Dancer's Hill House, Herts, England.
- Mr. Michael Calingaert, American Embassy, Colombo.

Mr. S. Pathmanathan, American Embassy, Colombo.
 Mr. K. B. Ekanayake, Rubber Control Department, Colombo.
 Mr. I. Levin, Tel Aviv, P. O. Box 2581, Israel.
 Mr. Patric David Cossnett, Polymer Corporation, Ontario, Canada.
 Dr. G. W. Sanderson, Tea Research Institute, Talawakelle.
 Mr. Theodore Stevens, Del Mar, Calif., U.S.A.
 Mr. Richard Stevens, Del Mar, Calif., U.S.A.
 Mr. C. A. Jackson, I.C.I. Billingham Co., Durham, England.
 Mr. G. L. Baldit, Plant Protection Ltd., Fernhusrt, Haslemere, Surrey,
 England.
 Dr. L. Mullins, Natural Rubber Producers' Research Association, Welwyn
 Garden City, England.
 Mr. C. H. M. King, Chief Engineer, Walker Sons, Colombo.
 Mr. S. P. Samusenko, Counsellor for Economic Affairs, U.S.S.R. Embassy.
 Mr. S. M. Orlov, Technical Adviser, U.S.S.R.
 Mr. F. W. Harper, Harrisons & Crosfield Ltd., London.
 Dr. A. Rigenbach, Sandoz Ltd., Switzerland.
 Dr. Mervyn D. de Silva, A Baur & Co., Ltd., Colombo.
 Mr. H. Meyer, Sandoz Ltd., Switzerland.
 Dr. Y. E. Hermon, Medical Research Institute, Colombo.
 Mr. J. F. Herman, Udabage Estate, Deraniyagala.
 Mr. L. G. Kharapunov, Tyre Corporation, Kelaniya.
 Mr. E. Kaganovskaya —do—
 Mr. V. Lysenkov —do—
 Mr. V. Kyznetosov —do—
 Mr. V. Botjakova —do—
 Dr. A. Newsam, Acting Director, Rubber Research Institute of Malaya.
 Dr. R. L. Wastie, Rubber Research Institute of Malaya.
 Mr. Lim Tow Ming, Rubber Research Institute of Malaya.
 Mr. J. G. Bouychou, Institute Francais du Caoutchouc, Paris.
 Mr. J. P. Poliniere, I.R.C. Vietnam.
 Mr. G. Deconinck, I.R.C. Cambodge.
 Mr. J. M. Bell, Rosehaugh (Ceylon) Rubber Co., Ltd., Colombo.

Meetings, conferences, seminars etc.

Research Officers of the Institute attended the following meetings, seminars and conferences :—

1. Biennial Conference of the Rubber Research Institute of Ceylon.
2. Seminar on " The diseases of *Hevea* ".
3. District Planters' Association meetings.
4. The C.A.A.S annual sessions.
5. Council meetings of the Soil Conservation Society.
6. Meetings of the Formulary Committee on Agro-Chemicals.
7. Visiting Agents' Conference convened by Messrs. Carson Cumberbatch & Co., Ltd.
8. Meeting of the Colombo Rubber Traders' Association.
9. Meeting convened by the Rubber Controller to discuss imports of Magnesium sulphate.
10. Smallholdings Field Day.

Visits by Scientific Staff

	<i>Advisory</i>	<i>Experimental</i>	<i>Others</i>	<i>Total</i>
Botany Section	19	183	15	217
Plant Breeding Section	—	278	88	366
Plant Pathology Division	53	438	70	561
Soils Chemistry Division	34	65	34	133
Rubber Chemistry Division	159	11	116	286

SUMMARY OF RESEARCH

Botany Section

As in previous years, advice was sought on the choice of new high-yielding clones for use in replanting programmes and on tapping problems connected with methods for obtaining increased yields from low-yielding seedling and budded areas with the aid of yield stimulation or intensive tapping systems.

All previous yield stimulation experiments were discontinued as these areas were required for replanting. Two long-term experiments were set down in 1965 on two commercial estates to assess the effects of long-term stimulation in one case and to compare the yield responses from stimulation and tapping on the S/2, d/3, 67% system as against the standard S/2, d/2, 100% system without stimulation in the other.

An experiment to evaluate the long-term effects of tapping during the wintering period as well as the effects of yield stimulation on virgin bark is in progress at Dartonfield.

The list of planting materials recommended for use in Ceylon was completely revised during the course of the year and drastic changes have been made. According to the new list, only clones RRIC 45, PB 86, Wagga 6278 and G1 1 are recommended for general large scale planting. On the other hand, a large number of experimental clones are now recommended for small and medium-scale planting. To encourage such planting in the latter groups, RRIC clones 5, 36, 37, 88 and 89 have been declafed 'free' clones within the island.

Clone RRIC 45 continues to yield satisfactorily in the fourth year of tapping in a large-scale trial at Nivitigalakelle. It has desirable vegetative characters and is relatively unsusceptible to leaf and panel diseases. Clone RRIC 44 planted in the same experiment had recorded higher yields than RRIC 45. This clone however has the unsuitable morphological character of a fluted trunk.

The yields of clones RRIC 5, 7 and 41 continue to be promising. In the 1949 large-scale clone trial at Hedigalla, clone RRIC 86 recorded yields higher than that of the control clone PB 86.

Clones RRIC 88 and 89 continue to maintain high yields in the 1946 replanted area at Nivitigalake Experimental Station. These two clones have now been included in a number of large-scale clone trials under commercial conditions.

Clones RRIC 90 and 91, which are final selections from the 1962 small-scale clone trial at Hedigalla, will be included in further large-scale clone trials in 1966.

Clone RRIC 36 had maintained high yields in all the Institute's experimental areas. This clone is however very susceptible to Bark Rot when planted in the wet districts.

In a multi-clone trial in the Kalutara District clone RRIM 623 outyielded all other clones during the first two years of tapping. In 1965 the average yield was 33.3 g per tree per tapping as compared with 19.9 g per tapping in the control clone PB 86.

A programme was drawn up for the setting down of yield trials of the more promising clones in commercial estates. These trials would give us data on the suitability of *Hevea* clones for particular districts as well as their performances under actual commercial conditions. One such trial is already in progress in the Avisawella District and arrangements have been made to set down similar trials in 1966 in the Ratnapura, Moneragala, Kalutara, Kelani Valley, Kegalle and Matale Districts. By the end of 1966 the clones RRIC 5, 36, 41, 45, 52, 75, 86, 88, 89, 91 ; RRIM 605, 701, Nab 15 and AVROS 427 are likely to be under test in these yield trials.

The two trials set down to evaluate the feasibility of economically intercropping rubber with cocoa or coffee in marginal areas in the Koslanda and Kurunegala Districts respectively are progressing satisfactorily.

Plant Breeding Section

The first test tapping results from the *Oidium* and *Phytophthora* test areas at Keppitigala and Peenkande respectively have come to hand. Clone 451 (RRIC 52 and PB 86) was the highest yielder from among the *Oidium*-tolerant clones and clone 1261 (RRIC 52 and T 792) from among the *Phytophthora*-resistant clones.

Positive results of non-susceptibility to *Gloeosporium* leaf disease in the immature phase were obtained at Nakiadeniya Group. Of the large number of plants of the *Oidium*-tolerant clone 1108 (RRIC 52 & RRIC 7) that were planted in this experiment only one plant was infected, indicating a combination of *Oidium* and *Gloeosporium*-resistance.

On the basis of early tapping tests and girth observations made towards the end of the previous year, the complete hand-pollination programme was shifted this year from Dartonfield Group to an outside estate where a selection of *Dothidea* resistant clones had been established in an experimental area in 1960. A satisfactory set of some important crosses was obtained. A difference in the flowering time of the IAN and local clones made it difficult to obtain the optimum number of pollinations in some crosses. Ineffective control of *Gloeosporium* and *Phytophthora* too contributed to the poor overall success of the pollination programme.

Selections have been made on the basis of secondary characters, girth, and Hamaker-Morris-Mann yield tests in the various plant breeding test clones. Those selected, will be further tested in small-scale trials.

Plant Pathology Division

Thirty-one diseased specimens sent to the Institute in connexion with advisory work were identified by this division.

Dr. O. S. Peries continued his duties as co-ordinator of the International Rubber Research and Development Board on research on leaf and bark diseases. The highlight of this work was the successful liaison meetings held in Colombo on the "Diseases of Hevea" in November 1965.

Studies on the nutrition of *Phytophthora meadii* and *P. palmivora* were continued. The work on the rate of growth on various sugars have been completed, and the studies on nitrogen and vitamin requirements are now in progress.

Studies on physiologic specialization of *P. meadii* are also in progress, and the preliminary indications are that there are at least five physiologic races of this fungus on *Hevea* in Ceylon.

Wintering was very uneven during the *Oidium* leaf disease season with the result that during March and April, heavy *Oidium* infection was reported. Of seven field experiments carried out for *Oidium* control, 4 experiments gave no significant results while the results in respect of the other 3 experiments were significant at the 5% level.

In the absence of *Peries Periods* the incidence of *Phytophthora* leaf disease in 1965 was negligible. There was confirmatory evidence once again that it is the rubber pod which provides the inoculum for the leaf-fall phase of this disease. The absence of *Peries Periods* also resulted in none of the field experiments on *Phytophthora* leaf disease control reaching the level of statistical significance.

The incidence of *Gloeosporium* leaf disease was also comparatively low in 1965. Observations were continued throughout the year on clonal susceptibility to *Gloeosporium*, distribution of the disease in various districts, virulence of the pathogen during different periods of the year and the relationship between foliar flush and incidence of the disease.

Bark Rot was generally low during the year, except in isolated cases where the disease had got out of hand, because of failure to eradicate it in its early stages. If the disease is detected in its early stages, and remedial action is taken immediately, there is evidence now, that this disease can be kept under control even in bad years. An important precautionary measure which should be taken to ensure that the incidence of this disease is kept low is to avoid at all times the tapping of wet trees.

The moisture, the nitrogen, the phenol and the amino acid contents of the bark of seven clones were carefully determined and compared to ascertain whether there is a correlation between any of these factors and the susceptibility of those clones to Bark Rot. The histological characteristics of the bark of these clones were also examined and compared with one another for the same reason.

Two new fungicides were tested in the laboratory for bark disease control, one of them a mercury based paint, showed promise as a water-proof panel dressing.

Pure culture experiments with *Fomes lignosus*, to assess the role of the bark in the infection of dead wood by the fungus, were initiated.

Studies on the distribution of soil fungi under *Hevea* in various conditions are being continued.

Culture of selected *Rhizobia* spp., for the inoculation of *Pueraria* seeds have been maintained in the division and issued free to estates on request.

Three new spraying machines were tested and helpful suggestions for the improvements of the machines were made to the firms supplying them.

Field experiments have helped to confirm the earlier belief that a certain degree of biological control of *Fomes* could be achieved by introducing small quantities of sulphur (about 1/4 lb) to the planting hole. Care must, however, be taken to ensure that no more than 4 ozs. of sulphur is used per planting hole. A high dosage of sulphur can be toxic to rubber roots.

Laboratory studies on the biology of spore germination and host-parasite relationships of *Gloeosporium*, *Oidium* and *Phytophthora* as well as studies on the epidemiology of these diseases have been continued.

The bark cracking phenomenon in young trees of certain clones as studied by the Head of the Plant Pathology Division indicated a virus as the causal agent. Further confirmatory evidence is being sought with the aid of electron microscopic studies.

Soils Chemistry Division

Every effort was made to execute the specialised advisory functions of this division either by advisory visits or through correspondence. Twenty estates were visited by divisional officers. Of these eleven were concerned with instances of backward growth and/or unusual foliar symptoms. One case of unusual foliar symptoms turned out to be a case of Boron toxicity resulting from the incorporation of a Boron compound in the fertilizer mixture applied to growing plants.

While the surveying of soils in rubber-growing areas in Ceylon at a semi-detailed reconnaissance level was continued, a detailed soil survey of the area covered by the Ambalangoda one inch survey sheet was completed during the period under review. 114 soil samples were collected for laboratory investigations in connexion with the different surveys.

A study of the Potassium status of certain soils in the rubber-growing areas of Ceylon was undertaken, and information was obtained by determination of mechanical composition, certain exchange capacity, and total exchangeable bases on bulked samples from different sampling points.

A trial area was planted at Dartonfield according to the new strict contour system of planting by way of an exploratory demonstration trial.

Ground cover policies have been subject to re-appraisal in view of rising operational costs in maintaining pure stands of leguminous covers in replantings.

Work on weed control has been restricted to the testing of some of the newer herbicides as and when they became available during the course of the year.

Results from long-term field trials at Hedigalla have now provided evidence that clonal rubber which had been regularly fertilized during the immature phase does respond to continued fertilizer applications during the early years of the mature phase; whereas the response from trees that had not been fertilized during the immature phase was negligible.

Results from fertilizer trials also indicate that fertilizer treatments that gave the highest response in terms of trunk girth increases were not necessarily the treatments that gave the highest yields during the early tapping years.

There is also evidence that clone/fertilizer interaction has not been found to be significant even with clones differing widely in growth and/or yield capacity.

It must be emphasized that the above findings, while they cannot be regarded as being final, have been obtained under a specific set of conditions as obtains at Hedigalla.

There were five experiments in progress to compare the response to fertilizers applied as determined by foliar diagnosis with the response obtained to applications of fixed quantities of inorganic fertilizer mixtures.

The fertilizer trials on mature areas continued to show no significant differences in yield due to treatments in spite of the fact that they have been in progress for periods ranging up to five years.

Rubber Chemistry Division

The Rubber Research Board has initiated action to establish a pilot plant for crumbled rubber manufacture in Ceylon. Two officers of the Rubber Chemistry Division visited the Rubber Research Institute of Malaya to study this process as well as to gather information on technical specification tests.

The general objective of technical specification is to work towards the establishment of a limited number of grades of naturally produced rubber which conform to certain standards. Samples of Estate Brown Crepe and Pale Crepe from estates and brokers were analysed and classified with a view to selling them to a technical specification.

Experiments were carried out to determine the factors which affect the Plasticity Retention Index of raw rubber. It was found that the PRI could vary with the clone from which the latex is obtained. The PRI of panel scrap and cup lump have a much lower value than that of the corresponding latex. An explanation for this could be that they have been exposed to sunlight and to atmospheric conditions for about 2 days. Another explanation is that there is an increase in calcium content towards the end of latex flow and during spontaneous coagulation the phosphatides in latex get degraded by the enzyme phospholipase D activated by calcium ions. This effect could be minimised by the addition of EDTA before acid coagulation. Another explanation is the higher copper, manganese and iron content. Thiol groups also catalyse the oxidation of phosphatides. The oxidation could be minimised by the addition of very low concentrations of Antimucin. However, higher concentrations of Antimucin lower the PRI as mercury is a pro-oxidant.

Oxalic acid is the best coagulant to give a high PRI in crepe manufacture. This may be due to its complexing and hence inactivating the calcium present in latex. The use of RPA 3 causes a lowering in PRI. This is expected as RPA 3 is a peptising agent. Further the thiol group in RPA 3 catalyses the enzymatic degradation of the phospholipids in rubber causing a lowering of PRI. Sodium bisulphite which is used to prevent enzymatic discolouration of rubber acts as an antioxidant increasing PRI.

The Rubber Research Institute continued to send monthly samples of latex from certain specific clones to the Natural Rubber Producers' Research Association, England for purposes of research.

Estates were given advice, when sought, on smoke house operation, drying tower operation, sole crepe, crepe and sheet manufacture, pre-coagulation etc. It was found that where calcium causes pre-coagulation (such as in estates in the Matale District) the use of washing soda as an anticoagulant in the field and in the transportation tank was very effective in minimising pre-coagulation.

A preliminary trial to ascertain the cost of collection of rubber seeds was carried out on an estate in Polgahawela. While rubber oil extracted from seed thus collected would not be too suitable as a drying oil it may seem satisfactory in the manufacture of liquid soap.

Smallholdings Department

The work of the Smallholdings Department increased during the year. Large number of subsidy and new planting permits were issued again. The usual free advisory extension services were available to rubber smallholders.

Two Advisory Officers of the Rubber Research Institute of Malaya were on a study tour of smallholdings from 20th to 29th October.

The department participated in the Ceylon Government Industrial Exhibition which commenced on 1st February as well as in 7 other exhibitions.

During the year a total of 105 publicity meetings and exhibitions were conducted in the ranges. The usual set of slides were projected till September when the unit commenced to screen cine-films on rubber.

The Divisional Advisory Officers conducted a series of lectures in the Sinhala medium on rubber, to Farm School students in various Farm Schools. They also addressed a Rural Development Society and a Kantha Samithi. Rubber Instructors too addressed groups of rubber smallholders on rubber planting, production and manufacture. Officers of this department attended four other meetings convened by different agricultural organisations.

The Sinhala version of the Smallholdings Leaflet No. 10 has been prepared and is with the printer. Several leaflets were reprinted. The Annual Review of the department was published in Sinhala and distributed among smallholders.

2,419 demonstrations on various aspects of rubber manufacture as well as 3,426 visits to smallholders' smoke houses were undertaken with a view to increasing the output of better quality smoke sheets.

A total of 4,253½ acres were dusted in 43 State-aided Co-operative Sulphur Dusting Groups.

The scheme of training smallholders in rubber tapping was continued in 1965 and out of a total of 738 trainees, 651 successfully completed the course and were awarded certificates.

As in previous years considerable assistance was given by this Department to the Rubber Replanting Subsidy Scheme. This took the form of preliminary visits, contour lining for planting holes and/or soil conservation drains, the marking of tapping cuts on trees in smallholdings reaching tappable girth and the random checking of planting material issued through Commodity Purchase Depots.

In 'new planted' areas, the department assisted the Rubber Controller considerably by undertaking preliminary visits, advisory visits, demonstrations, contour lining, as well as special inspections when so requested.

The Annual Field Day of the department was held at Mawanella. The Director and the Head of the Rubber Chemistry Division were present. The Rubber Instructors were addressed on rubber sheet manufacture by the Head of the Rubber Chemistry Division as well as by two other members of his staff.

Estate Department

Dartonfield Group consists of the three estates Hedigalla, Nivitigalakelle and Dartonfield comprising in all 1,491 acres. The planted acreage of 996 acres is made up of experimental areas as well as commercial sections. The latter consists of blocks in which the Research Staff has no further interest for scientific investigations. Six acres of *Hevea benthamiana* and *Hevea spruceana* planted for breeding purposes were taken out of tapping due to their low-yields. A 57-acre block at Hedigalla makes up a nursery supplying clonal material to the Rubber Replanting Subsidy Scheme.

The Kuruwita Sub-station of the Institute in the Ratnapura District is overseen by a Visiting Superintendent. It has a total acreage of 248 $\frac{3}{4}$ acres. With the uprooting of a further 10 acres of pre-war polyclonal rubber for replanting in 1966, this Sub-station will have only 30 acres of old rubber in various stages of intensive tapping prior to replanting over the period 1967 — 1969.

PUBLICATIONS RECORD — 1965

General

- Annual Review for 1964.
- Annual Report of the Rubber Research Board for 1964, Part I
- 1st & 2nd Quarterly Journal for 1965 (Conference Proceedings)
- Advisory Circular No. 74 on "Sale of Budwood"
- 3rd & 4th Quarterly Journal for 1965.
- Advisory Circulars Nos. 44, 50, 51, 58 and 71 were reprinted.
- Advisory Circular No. 66 on "Manuring of Rubber" was reprinted incorporating an appendix.
- Annual Report of the Smallholdings Department for 1964 — Sinhala.
- Smallholdings leaflet No. 10 on "Manufacture of Smoked Rubber Sheet"

Revised leaflets

- R.R.I.C. *Oidium* Questionnaire dated 13th February 1965.
- R.R.I.C. *Phytophthora* Questionnaire dated 24th May 1965.
- Leaflet on "Preliminary Details of the Mechano Chemical Crumbling Process"
- Leaflet on "Technical Specifications for Natural Rubber"
- Circular letter to Agency Houses on Manurial Trials on Outside Estates.
- Leaflet on "Interplanting Food Crops on Lands Replanted with Rubber"
- Leaflet on "Why Technical Service for Natural Rubber"
- Leaflet on "Yield Stimulation and Stimulants"
- Ready reckoner for determining planting points along contour — stand per acre — 150 trees.
- Circular letter to Agency Houses on R.R.I.C. Free Clones.

Papers

- Chandrasekera, L. B. Recommended clones and some factors that affect their performance in Ceylon. *Rubb. Res. Inst. Ceylon Quart. J.* 41, 55 - 62.
- Fernando, D. M. An outline of the breeding selection and propagation of rubber. (Read at the 21st sessions of the C.A.A.S. — December 1965).

- Jeevaratnam, A. J. Role of fertilizers in the production of natural rubber. *Tropical Agriculturist*, CXIX
- Jeevaratnam, A. J. Innovations in cultivation and fertilizer practices. *Rubb. Res. Inst. Ceylon Quart. J.* 41, 23 - 32.
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BOTANY SECTION

By

L. B. CHANDRASEKERA

ADVISORY WORK

Advisory work has been confined mainly to recommendations of planting material, tapping problems and the use of yield stimulants. The Head of the Botany Division and the Botanist paid advisory visits to estates as and when necessary.

YIELD STIMULATION EXPERIMENTS

All previous yield stimulation experiments had to be discontinued in 1964 owing to the progressive replanting of areas under stimulation. Two new experiments were therefore set down in 1965.

Field Experiment No. 1—Long-term yield stimulation — Clone LCB 1320—This experiment was set down in an estate in the Kalutara district in order to assess the long-term effects of stimulation at 6-monthly intervals. The first application of stimulants was made in August 1965 on bark of 1st renewal on clone LCB 1320. Applications were on $1\frac{1}{2}$ inches of scraped bark below the tapping cut.

The experiment consists of 6 tapping tasks, three of which are treated with RRIC Mixture I while 3 tapping tasks serve as the controls.

The yields from August to November 1965 are presented in Table I.

TABLE I
LONG-TERM YIELD STIMULATION EXPERIMENTS
Tapped S/2, d/2, 100%
Average yield in lb dry rubber per tapper

	RRIC Mixture I	Unstimulated (control)
Average yield before stimulation	10·1	10·2
Average yield after stimulation	11·3	10·3

Field Experiment No. 2 — Yield stimulation and tapping — clone Tjir 16 —
 This experiment was set down in September 1964 in an estate in the Matale district.
 The treatments consist of the following.

1. Tapped S/2, d/3, 67% and using a yield stimulant at 6-monthly intervals.
2. Tapped S/2, d/2, 100% without the use of a stimulant.

Each treatment is applied to 3 tapping tasks of clone Tjir 16. Application of the yield stimulant RRIC Mixture I is made on a 1½ inch strip of scraped bark below the tapping cut at 6-monthly intervals.

The yield results from September to November 1965 are presented in Table II.

TABLE II

Average yield in lb dry rubber per tapper

	Stimulated and tapped on S/2, d/3, 67%	Unstimulated and tapped on S/2, d/2, 100%
Average yield	16.0	14.5

During the period of 3 months the three plots that were stimulated and tapped on 67% intensity have recorded an average increase of 1½ lb dry rubber per tapper at each tapping.

TAPPING EXPERIMENTS

Field Experiment No. 3 — 1954 tapping experiment — Dartonfield — This experiment consists of 2 treatments:—

1. Tapping cuts opened at 42 inches above the union.
2. Tapping cuts opened at 50 inches above the union.

The yield and girth figures, representing the average for each plot of 5 trees per clone, for 1965 are presented in Table III.

TABLE III
1954 TAPPING EXPERIMENT — DARTONFIELD

Tapped S/2, d/2, 100%
Yield in grammes per tree per tapping

Clone	Tapping height 42"			Tapping height 50"		
	Virgin bark thickness in mm	Girth in inches at 5 ft.	Yield in grammes	Virgin bark thickness in mm	Girth in inches at 5 ft.	Yield in grammes
RRIC 8	6.8	27.0	16.3	7.0	27.1	14.0
" 16	7.4	28.5	18.9	7.4	30.7	19.0
" 17	7.6	25.8	18.2	8.0	29.2	26.5
" 18	7.4	26.7	15.6	7.0	27.8	18.8
" 20	7.0	25.0	19.9	6.6	26.8	15.5
" 21	7.0	27.2	17.0	7.0	28.7	16.2
" 22	7.5	26.1	23.7	7.0	26.1	21.4
" 23	7.2	24.2	12.2	7.7	25.5	18.2
" 24	8.2	30.8	19.8	8.0	32.1	22.6
" 25	6.8	22.9	10.8	6.6	24.0	10.7
" 26	7.2	25.2	20.5	7.5	26.2	17.9
" 27	7.3	20.3	8.1	7.6	21.3	7.3
" 28	7.3	27.3	23.6	7.5	27.4	21.2
" 30	7.4	27.5	13.1	7.6	25.0	15.5
" 31	7.0	26.8	25.0	7.0	29.6	28.9
" 32	7.3	21.3	18.0	7.5	22.1	14.3
" 33	6.6	22.6	18.5	7.4	24.4	24.1
" 34	8.6	22.8	18.3	10.0	24.7	27.0
" 35	7.3	24.8	17.9	8.0	24.9	16.3
" 36	9.0	29.5	35.1	8.2	29.1	35.7
" 37	8.0	23.3	18.5	7.2	27.7	32.5
" 54	8.0	26.7	27.9	8.0	29.3	29.3
" 57	7.4	25.8	25.7	8.5	26.7	40.1
PBT — 207	10.0	29.6	29.6	9.6	29.3	23.2
PB — 28/59	8.2	23.7	28.8	7.5	28.3	25.7
PB — 24/3	7.5	25.2	20.7	7.0	24.7	19.9
PB — 24/51	8.0	23.1	14.0	6.0	26.6	13.7
Mean	7.6	25.5	19.8	7.6	26.8	20.9

Field Experiment No. 4 — 1964 Winter tapping-cum-yield stimulation trial

A small-scale replicated experiment was initiated in 1964 in order to assess the long-term effects of yield stimulation on virgin bark at 6-monthly intervals combined with tapping with and without a rest during the wintering period.

The girth and yield data for the first two years of this experiment are presented in Table IV.

TABLE IV
WINTER TAPPING AND YIELD STIMULATION EXPERIMENT — DARTONFIELD

Yield in grammes per tree per tapping
Test-tapped from March 1964

	(Nab 12)	A	B	C	D
Average girth in ins. (1964)	...	27.5	27.9	27.5	27.4
Average girth in ins. (1965)	...	28.7	29.2	28.6	28.3
Girth increase	...	1.2	1.3	1.1	0.9
Average yield before treatment	...	41.9	41.5	39.2	41.0
* Average adjusted yield (1964)	...	58.0	55.2	56.4	50.2
Average adjusted yield (1965)	...	44.3	43.6	43.4	41.2
(PB 86)					
Average girth in ins. (1964)	...	27.0	27.1	27.0	27.9
Average girth in ins. (1965)	...	28.2	28.4	28.6	29.6
Girth increase	...	1.2	1.3	1.6	1.7
Average yield before treatment	...	31.7	35.0	32.8	39.1
* Average adjusted yield (1964)	...	44.7	46.3	42.1	41.4
Average adjusted yield (1965)	...	41.9	39.7	40.1	36.7

* Yield results for 5 months.

- A — Yield stimulation of virgin bark/tapping without winter rest.
- B — Yield stimulation of virgin bark/tapping with winter rest.
- C — No stimulation and tapped without winter rest.
- D — No stimulation and tapped with winter rest.

CLONE EVALUATION TRIALS

Clones derived from H. P. seedlings

The test tapping results of small-scale trials of clones derived from the 1939-41 and 1944 hand pollination programmes are presented in Appendix I. Selections from these have been included in subsequent large-scale trials.

Field Experiment No. 5 — Large-scale clone trial — 1946 replanted area — Niviti-galakele

RRIC 88 and 89

Test tapping results for 1965 are presented in Table V.

TABLE V
LARGE-SCALE CLONE TRIAL — 1946 REPLANTED AREA — NIVITIGALAKELE

• Yield in lb dry rubber per tree per year
tapped S/2, d/2, 100%

	RRIC 88	RRIC 89
No. of trees tapped in 1965	22	22
Yield — 1960	22.3	21.2
„ — 1961	25.2	21.7
„ — 1962	23.1	22.4
„ — 1963	20.3	20.0
„ — 1964	24.1	22.1
„ — 1965	24.6	26.0
Brown Bast cases	2	2
Canker and Bark Rot cases	—	1
Wind damage cases	1	—
Girth in inches, 1965	39.3	37.5
Bark measurements in mm.	Virgin 12.6 Renewed 10.6	11.2 9.5

These two clones have been included in further large-scale trials at Dartonfield in 1961 and in a replicated yield trial in a commercial estate in 1964. Clones RRIC 88 and 89 are now recommended for planting on a small-scale in estates.

Field Experiment No. 6 — 1952 small-scale clone trial — Hedigalla

RRIC 90 — 95

The yields of RRIC 90 and 91 in the small-scale clone trial at Hedigalla are promising. The yields for 1965 are presented in Table VI.

TABLE VI
1952 CLEARING — HEDIGALLA
Tapped S/2, d/2, 100% from July 1960
Yield in lb dry rubber per tree per year

Clone	No. of trees tapped 1965	Yield					Girth in inches 1965	Bark thickness in mm	
		1961	1962	1963	1964	1965		Virgin bark	Renewed bark
RRIC 90	5	20.5	21.1	26.0	26.5	26.4	37.7	9.5	8.9
„ 91	5	22.9	25.3	22.3	25.3	24.6	31.2	9.2	7.3 (1BB)
„ 92	5	16.7	15.5	15.8	16.6	17.1	31.8	8.2	7.7
„ 93	4	15.8	18.2	23.9	21.9	17.1	27.4	9.2	8.1 (1BB)
„ 94	4	15.6	17.7	19.6	18.2	17.1	26.1	8.6	6.8 (1BB)
„ 95	5	14.5	15.6	13.3	19.1	14.1	36.0	9.2	7.8

Clones RRIC 90 and 91 have been included in further large-scale trials at Nivitigalakele Experimental Station in 1962 and at Dartonfield in 1965.

Field Experiment No. 7 — 1954 clone trial — Nivitigalakele

Clone PB 28/59 continues to be the best yielder in this trial. Test tapping results for 1965 are presented in Table VII.

TABLE VII
1954 CLONE TRIAL — NIVITIGALAKELE
Tapped S/2, d/2, 100% from March 1960
Yield in lb dry rubber per tree per year

	IRCI 10	IRCI 7	PB T-207	PB 6/5	PB 24/3	PB 28/59	PB 24/51	RRIM 501
Yield in 1961	18.8	10.2	7.0	8.9	8.6	14.2	7.6	9.7
„ „ 1962	10.5	9.2	9.5	10.2	9.9	15.3	8.3	11.9
„ „ 1963	8.4	8.8	9.1	10.3	10.5	14.2	9.0	12.6
„ „ 1964	9.1	9.5	10.7	11.9	12.0	15.1	10.3	13.6
„ „ 1965	8.1	10.6	11.2	10.4	12.6	16.3	10.0	13.1
No. of trees tapped in 1965	104-95	154-150	85-74	155-147	142-138	139-136	159-156	141-140
Canker and Bark Rot cases	20	7	11	16	17	17	9	13
Brown Bast cases	2	3	5	1	3	3	—	4
Wind damage cases	70	22	102	15	18	22	7	36
Total casualties to date	92	32	118	32	38	42	16	53
Mean girth in inches 1965	23.6	28.1	25.6	24.6	26.8	28.1	27.5	25.9
Virgin bark thick- ness in mm	6.8	8.2	8.6	8.2	8.3	9.1	7.9	8.3

Field Experiment No. 8 — 1944 small - scale clone trial — Hedigalla — The test tapping of 2 budgrafts left out of the 3 original trees of clone RRIC 52 was continued in 1965. The yields are presented in Table VIII.

TABLE VIII
1944 SMALL-SCALE CLONE TRIAL — HEDIGALLA
Tapped S/2, d/2, 100%
Yield in lb dry rubber per tree per year

Clone	No. of trees tapped in 1965	Yield							Girth in inches 1965
		1959	1960	1961	1962	1963	1964	1965	
PB 5/122	3	23.8	35.5	29.8	22.8	30.2	31.1	23.4	43.1
RRIC 52	2	25.1	31.2	35.6	33.0	41.4	43.1	40.3	58.0
Control Wagga 6278	5	20.1	26.7	25.9	21.7	23.2	20.3	16.7	—

Field Experiment No. 9 — 1950 clone trial — Hedigalla — Chemara Clones

Test tapping results are presented in Table IX.

TABLE IX
CHEMARA CLONE TRIAL 1950 — HEDIGALLA

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

Tapped S/2, d/2, 100% from 1960

Yield in lb dry rubber ppr tree per year

	Ch 26	Ch 3	PB 86 Control
Yield — 1961	24.7	16.6	14.3
„ — 1962	27.0	19.4	18.1
„ — 1963	20.1	26.7	20.1
„ — 1964	22.6	19.2	20.7
„ — 1965	17.9	17.0	22.1
No. of trees tapped in 1965	34—33	41—36	65—68
Bark Rot and canker cases	—	—	—
Brown Bast cases	1	2	2
Wind damage cases	—	3	1

Field Experiment No. 10 — 1945 clone trial — Hedigalla

Clones RRIC 4, 5 and 7 represent the final selections from clones RRIC 2 — 7 in this trial. Test tapping results of these three clones are presented in Table X.

TABLE X
1945 CLONE TRIAL — HEDIGALLA

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

Yield in lb dry rubber per tree per year

	RRIC 4	RRIC 5	RRIC 7	Tjir 1 Control
Yield 1960	17.5	18.8	21.0	17.6
„ 1961	14.2	18.9	18.4	16.6
„ 1962	18.0	22.7	28.7	19.5
„ 1963	14.4	20.2	19.5	15.5
„ 1964	11.1	23.6	21.5	17.5
„ 1965	9.8	19.6	18.9	14.0
No. of trees tapped in 1965	49—37	55	69—68	66—62
Brown Bast cases	3	—	1	2
Wind damage cases (blown down)	9	—	—	2

The two clones RRIC 5 and 7 are recommended for small-scale planting on estates. These two clones have also been included in further large-scale trials.

Field Experiment No. 11 — 1950/51 clone trial — Hedigalla

Five clones were originally planted with PB 86 as the control clone in 25-tree plots replicated 3 times. Of these, clones RR 134, 108 and 116 were selected for further evaluation of yields and secondary characters. Test tapping results are presented in Table XI.

TABLE XI
SMALL-SCALE CLONE TRIAL — TRIAL NO. 2 — HEDIGALLA

Tapped on S/2, d/3, 67% from 1958

Tapped on S/2, d/2, 100% from 1960

Yield in lb dry rubber per tree per year

Clone	Yield					No. of trees tapped 1965	Brown Bast cases	Bark Rot cases	Wind damage cases
	1961	1962	1963	1964	1965				
RR 134	14.2	19.4	17.7	20.4	17.9	63—64	1	—	—
RR 108	15.2	15.9	12.7	15.3	13.7	57—55	2	—	—
RR 116	10.5	10.8	14.5	13.7	13.1	64—63	1	—	—
PB 86	13.3	16.3	15.9	17.0	16.9	63—61	—	1	1

The clone RR 134 is now represented by RRIC 99 and will be included in further large-scale trials.

Field Experiment No. 12 — 1949 clone trial — Hedigalla

Test-tapping results of the more promising clones are presented in Table XII

TABLE XII
1949 LARGE-SCALE CLONE TRIAL — HEDIGALLA

Tapped S/2, d/2, 100%

Yield in lb dry rubber per tree per year

Clone	No. of trees tapped 1965	Yield				Percentage of casualties upto 1965
		1962	1963	1964	1965	
RR 29	103—106	16.9	16.7	20.2	22.7	25
RRIC 86	74—76	21.0	19.3	20.9	22.0	50
PB 86	102—108	15.6	15.7	18.1	20.9	28
RRIM 501	64—67	17.7	13.8	18.2	17.9	55
RRIC 52	102—106	15.6	14.9	17.4	17.4	31
Dar. 38	98—105	11.6	12.5	16.5	16.2	32
RRIC 87	111—120	13.6	12.6	13.5	14.7	20
RRIM 513	109—112	13.4	11.6	13.0	12.8	27

The yield of clone RRIC 86 continues to be promising. This clone has been included in further larger-scale trials in 1962 and 1964. It is now recommended for small-scale commercial planting.

Field Experiment No. 13 — 1954 clone trial — Hedigalla

Clones in this trial were planted in monoclonal blocks of 800 to 1,000 trees per clone. Tapping commenced as individual clones reached tappable girth. Clones RRIC 16, 18, 22, 26, 35, 36 and RRIM 501 were first tapped in 1961; RRIC 19, 21, 24, 25, 28, 31, 34, 37 and AVROS 255 in 1962; RRIC 17, 23, 32, 33, PR 107 and PB 86 in 1963 and IRCI 10, NL 1 and one block of PR 107 in 1964. The growth of clones in this clearing had been relatively poor owing to heavy rainfall and monsoon storms. Test-tapping results are presented in Table XIII.

TABLE XIII

1954 LARGE-SCALE CLONE TRIAL — HEDIGALLA

First tapped in July 1961 on S/2, d/2, 100%

Yield in grammes per tree per tapping

Clone	No. of trees tapped in 1965	Girth in inches 1965	Yield			
			1962	1963	1964	1965
RRIM 501 ✓	626—673	23.6	28.2	39.6	39.7	42.9
RRIC 36 ✓	487—659	25.5	33.0	44.1	41.8	37.9
„ 35 ✓	495—624	25.7	33.5	32.2	30.6	32.5
„ 18 ✓	547—596	25.1	24.1	27.7	26.8	29.3
„ 34 ✓	574—617	24.2	36.3	32.3	26.3	28.1
PB 86* ✓	520—566	23.6	—	32.9	31.0	28.0
RRIC 22 ✓	620—622	26.5	25.1	21.7	26.8	27.9
„ 28 ✓	509—634	24.6	32.0	29.5	28.6	27.3
„ 32* ✓	572—595	23.5	—	21.4	23.6	25.7
AVROS 255 ✓	842—888	23.6	21.3	23.6	24.5	25.5
RRIC 37 ✓	462—565	22.8	28.8	23.0	28.4	25.3
PR 107* ✓	751—759	20.9	—	31.8	25.6	24.0
RRIC 19 ✓	540—602	22.8	16.0	18.5	25.3	23.5
„ 33* ✓	493—560	22.9	—	34.3	24.9	21.4
„ 31 ✓	598—636	24.5	21.0	14.7	15.6	20.0
„ 16 ✓	630—686	27.4	16.8	14.4	22.4	18.9
„ 20 ✓	432—587	23.5	16.7	18.3	21.9	18.2
„ 17* ✓	610—634	21.8	—	21.7	19.7	17.9
„ 21 ✓	536—564	26.4	14.4	10.4	15.4	16.2
„ 26 ✓	507—515	24.9	14.6	13.3	15.7	13.3
„ 24 ✓	621—677	26.8	10.7	10.9	14.2	12.9
„ 25 ✓	540—541	23.6	16.7	12.7	13.4	12.2
„ 23* ✓	629—646	22.1	—	16.6	15.5	11.9
'H' Block seedlings*	1806—1977	26.0	—	27.9	30.4	31.6
LCB 870xTjir 1 (B)*	154—183	25.7	—	19.3	19.6	20.0
IRCI 10** ✓	485—490	21.7	—	—	17.6	19.2
LCB 870xPR 107*	171—198	28.7	—	16.0	16.3	17.6
LCB 870x Mil 3/2*	139—193	27.7	—	14.3	17.1	16.2
NL1** ✓	62—65	24.5	—	—	17.4	16.1
PR 107 'K' Block	73—88**	23.7	—	—	10.3	15.5
LCB 870xTjir 1	156—171*	26.7	—	16.2	17.6	15.1

*First tapped May 1963.

**First tapped March 1964.

Clones RRIC 36 and 37 possess better vegetative characters and are now recommended for planting on an experimental scale. These two clones have a tendency to develop Bark Rot when planted under humid conditions.

Field Experiment No. 14 — 1955 clone trial — Hedigalla

12 RRIC clones are planted in monoclonal blocks of 750 trees per clone. Test tapping commenced in June 1962 and the results are presented in Table XIV.

TABLE XIV
1955 LARGE-SCALE CLONE TRIAL — HEDIGALLA
Yield in grammes per tree per tapping

Clone	No. of trees tapped in 1965	Yield				Girth in inches 1965	Bark Rot and Canker	Brown Bast	Wind damage	
		1962	1963	1964	1965				Branch and Stem	Up-rooted
RRIC 46	513—412	31.1	36.0	36.2	45.8	22.0	90	—	1	1
„ 13	622—615	30.3	33.1	34.8	45.5	23.0	—	7	1	1
„ 40	524—516	28.5	32.4	42.0	45.4	25.6	1	—	6	1
„ 50	585—577	17.7	33.2	38.4	40.3	23.3	—	4	4	—
„ 41	583—579	30.3	31.3	35.0	40.1	23.4	—	—	3	(1 <i>Fomes</i>)
„ 12	534—522	15.2	18.9	24.1	32.3	27.2	—	—	12	—
„ 47	602—580	20.3	27.0	26.2	32.1	22.4	—	19	3	—
„ 9	586—612	19.5	21.4	22.6	29.6	25.9	17	5	3	1
„ 11	524—499	21.6	24.8	27.4	25.6	25.0	—	—	24	1
„ 43	583—570	25.4	23.7	23.0	25.5	23.2	—	7	6	—
„ 14	648—617	21.3	17.2	19.8	22.5	25.0	—	20	5 3	3 (3 <i>Fomes</i>)
„ 49	571—487	23.1	20.0	20.1	15.0	24.3	—	68	14	(2 <i>Fomes</i>)
Mean		23.6	26.6	29.1	33.3	24.2	—	—	—	—

Clone RRIC 41 is now recommended for small-scale commercial planting.

Field Experiment No. 15 — 1953 clone trial — Nivitigalakele

Clones RRIC 44 and 45 were budded in the field on two-year old stocks. There are approximately 700 trees from each clone and were tapped from January 1962. The yield data are presented in Table XV.

TABLE XV

1953 LARGE-SCALE CLONE TRIAL — NIVITIGALAKELE

Tapped S/2, d/2, 100%

Yield in lb dry rubber per tree per year

	RRIC 45	RRIC 44
No. of trees tapped in 1965	604—580	579—570
Yield — 1962	8.9	10.8
„ — 1963	10.2	11.3
„ — 1964	10.6	11.7
„ — 1965	10.5	11.3
Brown Bast cases	5	7
Bark Rot and Canker cases	1	9
Wind damage cases	27	5
Mean girth in inches, 1965	25.4	23.9
Thickness of virgin bark in mm	7.2	7.3

Field Experiment No. 16 — 1956 clone trial — Hedigalla

All clones are planted in 300-tree monoclonal blocks. Tapping commenced in 1963-65 as individual clones reached tappable girth. Test tapping results are presented in Table XVI.

TABLE XVI

1956 LARGE-SCALE CLONE TRIAL — HEDIGALLA

Yield in grammes per tree per tapping

Clone	No. of trees tapped in 1965	Average girth in inches 1965	Yield	
			1964	1965
*PR 252 -	218—214	23.0	24.5	35.3
*IRCI 9 -	230—221	23.5	23.7	31.7
*PR 257 -	200—194	22.9	20.5	29.4
*RRIC 55 -	205—203	22.0	22.2	29.7
„ 48 -	158—212	21.8	26.0	28.4
PR 247 -	183—180	22.5	—	28.1
*RRIM 618 -	240—235	22.8	29.7	26.0
RRIC 39 -	167—214	21.6	21.7	25.3
RRIM 617 -	240	23.3	20.3	24.3
RRIC 54 -	228—226	22.4	15.8	23.6
*AVROS 1191 -	216—215	22.0	19.5	23.4
*IRCI 5 -	249—241	21.3	19.6	23.1
*PB 86 -	244—240	24.7	20.6	23.1
*PR 228 -	244—243	21.7	18.8	22.8
AVROS 1447 -	161—167	21.9	17.3	22.8
*RRIM 603 -	249—243	22.2	15.9	21.3
PR 253 -	209—206	21.1	25.7	20.3
PR 258 -	215	20.8	15.5	19.3
RRIC 59 -	204—198	21.6	15.9	19.2
*RRIM 612 -	249—248	27.0	9.8	17.7
*RRIM 605 -	237—231	22.5	14.7	15.7

* First tapped in July 1963

Field Experiment No. 17 — 1956 clone trial — Dartonfield

Clones GT 1, WR 101, AVROS 385 and AVROS 427 were planted in 300 tree monoclonal blocks. 48 points along the boundaries were planted with clone RRIC 52. The clone RRIC 52 came into tapping one year earlier in March 1962.

TABLE XVII

1956 CLONE TRIAL — DARTONFIELD
Yield in grammes per tree per tapping

	WR 101	GT 1	AVROS 385	AVROS 427	RRIC 52
No. of trees tapped in 1965	145—229	210—266	142—234	138—234	44—45
Yield — 1963	22.7	15.6	7.5	—	22.3
„ — 1964	26.0	19.9	17.9	32.9	22.9
„ — 1965	28.2	18.1	15.5	23.3	23.6

IMMATURE AREAS

Field Experiment No. 18 — 1961 clone trial — Dartonfield

This clone trial consists of large monoclonal blocks of approximately two tapping tasks per clone. The clones RRIC 88, 89, PB 28/59 and PB 86 were planted during the S. W. monsoon season while the rest of the clones were planted during the N.E. season in 1961. A summary of the average girth measurements for the years 1963—65 are presented in Table XVIII.

TABLE XVIII

1961 LARGE-SCALE CLONE TRIAL — DARTONFIELD

Average Girth in inches

	RRIC 52*	RRIC 7*	RRIM 513*	RRIC 45*	PB 86**	RRIC 88**	PB 28/59**	RRIC 89**
No. of trees	538	486	537	545	563	555	560	506
Average Girth 1963	5.1	4.6	4.4	5.8	5.2	4.7	4.9	4.0
Average Girth 1964	8.4	7.6	7.7	9.2	7.7	8.3	7.3	6.1
Average Girth 1965	13.1	11.3	11.6	12.4	10.7	12.0	11.2	9.6
Girth increase 1964/65	4.7	3.7	3.9	3.2	3.0	3.7	3.9	3.5

* Planted in 1961 N E.

** Planted in 1961 S.W.

Field Experiment No. 19 — 1962 large-scale clone trial — Nivitigalakele

The 17 clones included in this trial are planted in plots of approximately 150 trees per clone. The average girth figures of clones are presented in Table XIX.

TABLE XIX
1962 LARGE-SCALE CLONE TRIAL — NIVITIGALAKELE

Average girth in inches

Clone	Average girth
RRIC 91	12.9
RRIC 95	12.6
RRIC 5	12.1
RRIC 86	11.3
RRIM 701	11.3
RRIC 39	11.0
RRIM 623	10.6
RRIC 96	10.6
RRIC 94	10.4
RRIC 93	10.2
IAN 45—717	10.2
RRIC 92	9.8
PB 86	9.4
RRIM 628	9.3
RRIC 51	8.9
RRIC 90	8.0
RRIC 97	7.5

Field Experiment No. 20 — 1963 clone trial — Nivitigalakele

Approximately 300 points per clone of RRIC 59, 75, 60, 64 and PB 86 approximately 150 points per clone of RRIC 6, 41, 39, 98 and 150 points of PB 86; were planted in May 1963.

Field Experiment No. 21 — 1964 yield trial — Nivitigalakele

The clones RRIC 41, 45, 52 and 86 were planted during the S. W. monsoon season in 1964. Each clone is planted in approximately 106 trees per plot and replicated three times. This trial was set down in order to assess the comparative performance of the 4 clones with regard to growth and yield.

Field Experiment No. 22 — 1965 clearing — Nivitigalakele

A block of 10 acres was planted with clone RRIC 45 during the S.W. planting season in 1965. This block is to be used for future tapping experiments.

Field Experiment No. 23 — 1965 small-scale clone trial — Dartonfield

Approximately 5 acres were planted with 50-tree plots replicated 3 times of clones RRIC 5, 88, 89, 90, 91 and RRIM 600 during the S.W. planting season in 1965.

Field Experiment No. 24 — 1965 spacing trial — Kuruwita Sub-station

The 3 clones RRIC 41, 45 and 52 were planted at spacings of 8 ft × 30 ft and 12 ft × 20 ft. Each treatment is confined to a plot of approximately 150 trees per clone and replicated 3 times.

EXPERIMENTS ON COMMERCIAL ESTATES

Field Experiment No. 25 — 1957 clone trial — Estate A — Kalutara District

Six clones are planted in monoclonal blocks of 300 trees per clone with PB 86 serving as the control clone. It was planted in May/June 1957 and brought into tapping in March 1964. The test-tapping results are presented in Table XX.

TABLE XX
1957 SMALL-SCALE CLONE TRIAL — ESTATE A — KALUTARA DISTRICT

Yield in grammes per tree per tapping

Clone	Average Girth in inches					No. of trees tapped in 1965	Yield	
	1961	1962	1963	1964	1965 at 5 ft		1964 *	1965
TR 1406	13.5	17.5	21.1	23.4	23.6	247—250	26.5	28.2
IRCI 2	12.5	16.8	20.6	23.0	22.5	246—251	21.0	27.1
RRIM 607	11.8	16.2	19.6	22.3	22.4	268—273	25.2	24.8
IRCI 3	11.5	15.5	19.0	21.3	21.3	190—180	23.8	23.7
AVROS 529	12.0	15.6	19.3	21.8	21.7	265—270	16.7	19.0
PB 86	11.0	14.4	17.6	19.8	20.6	184—212	17.5	17.3
Mean	12.0	16.0	19.5	21.9	22.0	—	21.8	23.4

* Test tapped from March 1964

Field Experiment No. 26 — 1957 clone trial — Estate B — Kalutara District

(a) *10 Acres* — Five foreign clones are planted in monoclonal blocks of 300 trees per clone, with clone PB 86 serving as the control.

(b) *20 Acres* — Twelve local and foreign clones are planted in monoclonal blocks of 300 trees per clone.

Both these experimental areas were first tapped in April 1964 and their yields are presented in Tables XXI and XXII.

TABLE XXI
1957 CLONE TRIAL — ESTATE B — KALUTARA DISTRICT (10-ACRE BLOCK)
 Tapped on S/2, d/2, 100%
 Yield in grammes per tree per tapping

Clone	Average girth in inches					No. of trees tapped in 1965	Yield	
	1961	1962	1963	1964	1965 at 5 ft.		1964 *	1965
AVROS 1734	15.0	18.3	21.0	23.5	23.8	199—206	35.6	40.5
RRIM 612	15.5	19.2	22.3	25.5	26.0	190—214	19.8	24.8
TR 1548	15.5	19.3	22.3	24.7	24.9	197—198	22.0	23.9
AVROS 2037	15.0	18.4	21.7	25.1	24.7	215—218	21.1	20.0
PR 254	14.3	17.5	20.5	22.6	22.7	243—254	19.0	19.6
PB 86	13.8	16.3	18.9	20.8	21.7	182—198	23.9	23.6
Mean	14.8	18.1	21.1	23.7	24.0	—	23.6	25.5

* Test tapped from April 1964.

TABLE XXII
1957 CLONE TRIAL — ESTATE B — KALUTARA DISTRICT (20 ACRES)
 Tapped on S/2, d/2, 100%
 Yield in gram mes per tree per tapping

Clone	Average girth in inches					No. of trees tapped in 1965	Yield	
	1961	1962	1963	1964	1965 at 5 ft		1964*	1965
RRIM 623	14.3	17.3	20.6	22.6	23.8	209—223	29.8	33.3
RRIC 61	13.8	16.5	19.1	21.1	21.5	165—214	19.9	23.3
„ 76	14.0	17.4	19.9	22.0	22.2	252—271	17.8	20.4
RRIM 603	14.0	16.8	20.0	22.5	23.0	205—209	19.6	19.1
„ 622	14.0	17.0	19.9	21.7	21.9	213—223	21.3	19.1
WR 101	13.8	17.1	19.8	21.8	22.1	210—212	22.0	19.1
RRIC 75	15.5	19.0	22.0	24.5	25.4	178—200	21.7	18.4
PR 248	12.5	15.8	18.9	22.2	22.5	217—227	17.2	18.0
TR 1542	13.8	16.5	19.2	20.5	21.1	184—224	16.8	15.7
RRIC 60	14.0	16.7	19.8	22.4	23.0	231—242	12.4	15.3
RRIM 602	14.1	17.6	20.3	22.5	23.1	260—265	15.4	14.4
PB 86 (P. 1)	—	—	—	—	—	208—255	—	—
„ (P. 2)	12.4	15.3	18.3	19.8	21.0	199—224	18.0	19.9
„ (P. 3)	—	—	—	—	—	211—240	—	—
Mean	13.9	16.9	19.8	22.0	22.6	—	19.3	19.7

* Test tapped from April 1964

Field Experiment No. 27 — 1958 clone trial — Estate B — Kalutara District-31½ Acres.

A selection of local and foreign clones are planted in monoclonal blocks of 300 trees per clone. The clones were first tapped in April 1965. The test-tapping results are presented in Table XXIII.

TABLE XXIII
1958 CLONE TRIAL — ESTATE B — KALUTARA DISTRICT
Tapped S/2, d/2, 100% from April 1965
Yield in grammes per tree per tapping

Clone	Average girth in inches					No. of trees tapped 1965	Yield
	1961	1962	1963	1964	1965 at 5 ft		
AVROS 427	9.3	12.8	15.8	18.5	18.8	176	29.6
RRIC 36	8.8	13.5	17.2	20.4	21.5	185	24.1
RRIM 605	9.8	13.6	16.8	19.5	19.9	220	21.7
RRIC 39	8.0	14.9	18.9	22.1	22.7	213	20.4
RRIM 607	10.0	14.6	18.7	21.9	22.7	216	20.3
RRIC 28	8.3	13.8	16.8	19.1	19.9	198	19.5
IRCI 2	10.0	13.9	17.3	20.0	20.1	227	19.0
RRIC 41	11.0	14.8	18.0	21.1	21.9	263	18.2
WJ 1	8.5	12.2	15.4	18.6	20.1	169	17.7
RRIC 22	10.0	14.2	17.6	20.8	21.5	248	17.4
RRIC 54	10.3	14.7	18.0	20.7	21.7	192	17.3
RRIC 45	10.3	14.2	17.7	19.8	20.7	231	17.1
RRIC 37	10.0	14.0	17.5	20.2	20.4	186	16.3
IRCI 6	9.0	13.1	16.2	19.3	20.9	160	16.2
RRIC 52	9.3	16.2	20.8	22.8	24.6	256	13.8
GT 1	10.1	13.8	17.4	20.3	20.8	265	13.3
AVROS 385	9.3	13.5	16.6	19.7	21.0	190	11.1
RRIC 55	8.3	12.1	15.3	18.0	20.4	—	—
PB 86 (P.1)						146	
(P.2)	8.3	12.3	15.4	18.1	19.8	195	17.6
(P.3)						—	
(P.4)						176	
Mean	9.4	13.8	17.2	20.0	21.0	—	18.4

Field Experiment No. 28 — 1957/58 clearing — Estate C — Kalutara District

Test tapping results of a selection of clones from a commercial planting in an estate in the Kalutara District are presented in Table XXIV.

TABLE XXIV

CLONE TRIAL — COMMERCIAL ESTATES — KALUTARA DISTRICT — ESTATE C

Tapped S/2, d/2, 100%

Yield in grammes per tree per tapping

Clone	No. of trees tapped in 1965	Yield		Girth in inches 1965
		1964	1965	
<i>Division 1 * (1957 Clearing)</i>				
RRIC 36	143—175	31.9	34.5	22.6 /
IRCI 7	203—210	28.1	33.8	23.1 >
RRIC 37	110—178	28.4	28.8	21.1 /
„ 7	155—166	29.7	27.1	22.6 1
„ 5	199—212	22.8	26.1	22.0 .
„ 45	208—250	23.6	24.5	21.7 /
„ 41	206—232	28.6	24.2	28.9 /
„ 52	224—234	18.5	22.1	24.4 /
Mean	—	26.5	27.6	23.4
<i>Division 2 **(1958 Clearing)</i>				
RRIC 41	205—260	22.7	21.0	21.9
„ 52	224—253	16.1	17.3	24.8
Mean	—	19.4	19.2	23.4

*First tapped in September 1963.

**First tapped in January 1964.

YIELD TRIALS IN COMMERCIAL ESTATES

A programme of setting down replicated yield trials of promising clones in commercial estates was initiated in 1964. The purpose of these trials is to assess the comparative performance of clones under a wide range of planting conditions that are normally met with in the different districts of Ceylon. The data from such trials would be of assistance in the selection of clones that are most suitable to each planting district.

Field Experiment No. 29 — 1964 yield trial — Salawa Estate

One such yield trial had been set down in an estate in the Avissawella district during the 1964 N.E. planting season. Clones RRIC 45, 86, 88 and Nab 15 were planted in 150-tree plots replicated 3 times.

In early 1965 an appeal was made to Agency Houses and Estates for their co-operation in setting down similar yield trials in other planting districts and the response had been very encouraging. As a result, the Botanical Division has arranged to set down further yield trials in other districts in 1966.

INTER-CROPPING TRIALS

The possibility of inter-cropping rubber with subsidiary crops is being investigated. Such inter-cropping is likely to be of value especially in the drier planting districts where climatic conditions do not favour optimum growth and yield in rubber. Two such trials have already been set down in 1964 and 1965.

Field Experiment No. 30 — 1964 yield/inter-cropping trial — Rosebury Estate

Clones RRIC 45, 52 and PR 107 were planted in plots of 300 trees per clone replicated 3 times. Half of each plot will be interplanted with cacao at a later stage.

Field Experiment No. 31 — yield/inter-cropping trial — Redegama Estate

Clones RRIC 36, 45 and PB 86 were planted during the N.E. planting season in 1965. The experimental design is similar to the trial at Rosebury Estate and will be interplanted with cacao at a later stage.

These trials are expected to provide data on clone performance as well as any possible interaction between rubber and the subsidiary crop. Depending on the availability of land, it is proposed to extend such trials to include other crops as well.

APPENDIX I

TEST TAPPING RESULTS OF CLONES ESTABLISHED FROM HAND-POLLINATED SEEDLINGS

Origin of material	Year of planting	Clone	No. of trees tapped 1965	Yield in lb dry rubber per tree per year				No. of trees affected			Mean girth in inches at 60"	Bark thickness in mm	
				1962	1963	1964	1965	Canker and Bark Rot	Er own Bast	Wind damage		Virgin	Renewed
Nivitigalakele 1939 H.P. seedlings	1941	RRIC 51	5	29.4	28.6	30.9	30.7	1	2	—	54.2	13.4	12.0
		" 9	3	31.9	32.7	34.0	29.4	—	1	—	49.9	12.7	10.3
		" 14	2	14.3	20.0	29.3	24.2	2	1	1	41.3	13.0	9.7
		" 24	5	19.6	21.5	20.3	22.7	2	—	—	50.2	12.8	9.2
		Control Wagga 6278	—	—	10.6	10.0	11.3	—	—	—	—	—	—
Nivitigalakele 1940 H.P. seedlings	1944	RRIC 60	2	34.0	38.3	36.5	45.4	—	1	1	49.6	12.5	10.5
		" 45	1	47.1	53.8	43.8	42.0	1	—	2	52.8	13.0	12.0
		" 59	2	39.6	40.6	31.2	39.7	—	1	—	50.4	11.5	11.0
		" 40	1	31.7	29.8	32.1	34.9	1	—	—	49.1	14.0	14.0
		" 39	1	46.3	35.2	47.6	33.0	1	—	1	49.4	14.0	13.0
		" 41	2	41.0	39.0	31.6	31.2	—	2	—	43.8	13.0	9.5
		Control Wagga 6278	—	19.3	20.5	20.0	21.6	—	—	—	—	—	—
Hedigalla 1941 H.P. seedlings	1943	RRIC 33	3	30.9	35.6	36.0	35.2	—	1	—	50.0	12.4	—
		" 75	2	32.3	36.5	36.3	23.5	—	—	—	40.1	10.0	—
		" 32	5	—	21.6	31.2	21.1	—	—	—	37.9	9.6	—
	1944	Control Wagga 6278	5	—	21.5	21.1	18.6	—	1	—	—	12.8	—
		RRIC 79	4	26.9	32.8	34.1	31.7	—	—	—	48.6	12.0	—
		" 76	4	28.4	34.5	35.5	29.5	—	—	—	46.6	12.3	—
		" 46	3	21.6	24.8	28.7	27.2	—	—	—	39.5	10.3	—
		" 50	4	40.1	37.7	32.2	26.7	—	—	—	46.0	12.8	—
		" 37	4	26.0	28.6	34.1	25.6	—	—	—	38.5	11.0	—
		" 35	4	30.6	32.2	27.6	25.3	—	—	—	46.1	11.0	—
		" 47	4	21.0	21.9	22.1	23.1	—	1	—	41.9	10.8	—
		" 74	4	26.8	27.9	28.8	23.0	—	—	—	43.1	13.4	—
		" 49	1	—	20.8	19.9	20.0	—	—	—	47.1	9.0	—
		" 36	3	30.9	31.0	32.4	19.0	—	—	—	45.1	11.5	—
		" 38	4	—	25.6	23.3	17.5	—	—	—	42.1	12.3	—
		" 48	4	—	17.4	19.5	16.9	—	1	—	30.5	7.8	—
" 34	4	—	13.5	16.7	15.4	—	—	—	36.4	8.0	—		
Hedigalla 1941 H.P. seedlings	1946	RRIC 96	5	32.4	26.2	23.6	34.7	—	—	—	44.5	11.0	—
		" 97	4	26.3	30.2	25.3	34.4	—	—	—	48.0	11.3	—
		" 98	4	40.4	30.8	29.0	30.5	—	2	—	39.3	11.7	—
		" 77	4	25.7	28.4	22.7	27.8	—	—	—	38.7	11.6	—
		" 57	5	—	24.0	23.2	27.3	—	—	—	34.7	11.0	—
		" 55	2	35.6	25.3	23.2	26.6	—	1	—	35.8	12.3	—
		" 61	4	23.6	19.5	23.0	24.2	—	—	—	37.5	10.7	—
		RR 241	5	25.0	20.2	23.0	21.4	—	—	—	33.9	9.6	—
		RRIC 54	4	—	20.6	18.4	21.0	—	—	—	38.7	9.5	—
		RR 233	5	—	24.8	22.4	20.5	—	—	—	35.3	9.2	—
		RRIC 62	2	—	25.0	34.3	**	—	—	2	—	—	—
Control Tjir	5	20.9	16.8	16.7	13.6	—	—	—	33.9	—	—		
Hedigalla 1944 H.P. seedlings	1947	No. 134	2	—	34.3	47.7	26.6	—	—	—	41.3	9.5	—
		RRIC 65	5	26.1	20.2	28.4	22.5	—	2	—	37.0	11.0	—
		" 64	5	34.7	25.6	30.7	20.1	—	—	—	36.9	9.6	—
		" 66	4	22.2	17.9	19.9	20.0	—	—	—	32.6	9.3	—
		" 78	3	24.2	19.3	23.6	12.9	—	1	—	32.2	8.3	—
		" 63	4	—	13.4	16.4	12.1	—	—	—	27.0	9.0	—

** Blown down.

INDEX TO FIELD EXPERIMENTS

- (1) Long-term yield stimulation experiment — clone LCB 1320
- (2) Yield stimulation and tapping experiment — clone Tjir 16
- (3) Tapping experiment — Dartonfield
- (4) Winter tapping - cum - yield stimulation trial — Dartonfield
- (5) Large-scale clone trial — 1946 replanted area — Nivitigalakele
- (6) 1952 small-scale clone trial — Hedigalla
- (7) 1954 clone trial — Nivitigalakele
- (8) 1944 small-scale clone trial — Hedigalla
- (9) 1950 clone trial — Hedigalla
- (10) 1945 clone trial — Hedigalla
- (11) 1950/51 small-scale clone trial — Hedigalla
- (12) 1949 large-scale clone trial — Hedigalla
- (13) 1954 large-scale clone trial — Hedigalla
- (14) 1955 large-scale clone trial — Hedigalla
- (15) 1953 large-scale clone trial — Nivitigalakele
- (16) 1956 large-scale clone trial — Hedigalla
- (17) 1956 clone trial — Dartonfield
- (18) 1961 large-scale clone trial — Dartonfield
- (19) 1962 large-scale clone trial — Nivitigalakele
- (20) 1963 large-scale clone trial — Nivitigalakele
- (21) 1964 yield trial — Nivitigalakele
- (22) 1965 10-acre monoclonal block of RRIC 45 — Nkvitigalakele
- (23) 1965 small scale clone trial — Dartonfield
- (24) 1965 spacing trial — Kuruwita Sub-station
- (25) 1957 clone trial — Estate A — Kalutara District
- (26) 1957 clone trial — Estate B — Kalutara District
- (27) 1958 clone trial — Estate B — Kalutara District
- (28) 1957/58 clone trial — Estate C — Kalutara District
- (29) 1964 yield trial — Salawa Estate
- (30) 1964 yield/inter-cropping trial — Rosebury Estate
- (31) 1965 yield/inter-cropping trial — Redegama Estate

PLANT BREEDING SECTION

BY

D. M. FERNANDO

RESISTANCE BREEDING

Breeding for Oidium resistance

Oidium Testing Station — Kepitigalla Group — Mātale. Some of the selected clones were taken into routine tapping during the last six months of the year. Some of these clones were less than the usual tappable girth but as the rate of girthing is above average in these clones, an increase of girth is expected even after the commencement of tapping. More trees of these clones are expected to come into tapping in 1966.

TABLE I

1959 N.E. REPLANTED AREA, KEPITIGALA

First tapped June 1965 on S/3, d/2, 67%

Yield in grams per tree per tapping

Clone	Parentage	No. of trees tapped	Girth in inches at 36.	Yield in grams
444.	RRIC 52xPB 86	1	18.7	13.1
* 451	,, x ,,	1	18.2	15.4
* 614	,, x ,,	1	18.4	9.4
* 828	PB 5/139xRRIC 52	1	18.0	4.3
* 864	,, x ,,	1	18.0	4.4
1004	T 170 x ,,	3	19.3	15.4
1010	,, x ,,	6	20.3	6.3
IAN 45—710	PB 86xF 409	1	17.6	18.0
RRIC 52	—	1	19.5	3.4

* 1960 N. E. planting

Of particular interest is the satisfactory growth and yield of *Dothidella*-resistant clone IAN 45 - 710 under these difficult conditions.

Though only one tree could be tapped in some of the clones, the yields, in comparison to the control clone RRIC 52, seem very favourable for this district. Clone 451 shows the greatest promise but its parentage budgrafting success is lower than the usual 95%.

Oidium Testing Station — Clodagh Group — Matale

All the clones selected after observations at Kepitigalla showed a satisfactory degree of resistance in contrast to control clone Tjir 1 which was very retarded. Clones 828 and 864 showed the best foliage. Some of the other clones which had a *Dothidella*-resistant background were selected for further trials on a larger scale.

Breeding for Phytophthora resistance

Phytophthora Testing Station — Peenkande Group — Nivitigala. Those clones which were growing vigorously and showed no signs of *Phytophthora* attack were taken in to tapping. As budwood was cut from most of them the yields were expected to be rather low in the first tappings. Here too very vigorous trees were brought into earlier tapping in order to investigate the yielding capacity of these crosses. The yields of the selections are given in Table II. Clone 1461 showed the most promise in growth as well as in yield.

TABLE II

1960 N.E. REPLANTED AREA — PEENKANDE

First tapped June 1965 on S/2, d/3, 67%

Yield in grams per tree per tapping

Clone	Parentage	No. of trees tapped	Girth in inches at 36	Yield in grams
687	PB 86xRRIC 52	1	17.0	8.5
690	„ x „	1	17.0	7.4
691	„ x „	2	17.5	13.4
788	PB 5/139xRRIC 52	1	18.2	14.5
1067	T 792x „	1	18.3	8.7
1142	LCB 1320xRRIC 45	1	17.7	8.0
1280	Ch 26 xRRIC 52	1	18.0	7.5
1289	RRIC 52xRRIC 86	1	19.5	12.6
1460	„ x T 792	1	19.0	7.5
1461	„ x „	1	21.3	18.7
FX 590	F 4542 x Tjir 1	1	17.0	7.6
PB 86	—	1	15.2	12.2

It was possible to bring in only one control PB 86 tree into tapping as the other trees of this clone were of insufficient girth. As this area is in the middle of a mature area the preliminary yields are found to be rather low.

Breeding for Gloeosporium resistance

The growth of this area is very satisfactory. Very wet weather towards the end of the year resulted in an attack of *Gloeosporium* leaf disease. 121 PB 86 trees

were affected and only 13 of the hand-pollinated selections were also affected. Clones 3221, 2018, and 6338 had 3 trees each attacked. Clones 1923, 1108, 3189 and 759 had only 1 tree each attacked. Other clones were completely free of *Gloeosporium* attack.

Hevea Breeding Stations — Monaragala District

Crown-budded Area — Nakkala Estate. Distinctive labelling was maintained throughout the year. Flowering was observed in RRIC 7.

Supplementary Station — Kumarawatte Group. A Hamaker-Morris-Mann early tapping test was conducted in this area and the following clones were selected for further trial. The results of this test were further clarified in the case of clones 516, 266, 1174 and RRIC 89 tested at the same time at Kuruwita. The following clones were found to have a yield level above the average of the ten best PB 86 plants selected from 150 PB 86 plants in an adjoining clearing planted at the same time.

Clone	Parentage	No. of trees	Girth in inches
516	RRIC 52 × PB 86	1	11.0
266	Mil 3/2 × Tjir 1	2	9.7
1307	RRIC 41 × Ch 26	1	14.1
1867	RRIC 45 × LCB 1320	2	9.2
1174	Ch 26 × RRIC 7	2	12.8
RRIC 89 (3 tapped)	—	17	8.74
843	PB 5/139 × RRIC 52	1	12.7
1606	RRIC 41 × GPM 1	2	12.1
1038	Tjir 1 × Wagga 6278	2	13.5
1259	Ch 26 × RRIC 52	2	14.3
1487	Nab 20 × RRIC 7	2	10.8
PB 28/59 (3 tapped)	—	35	8.43
PB 86	—	15	10.2
RRIC 52 (5 tapped)	—	18	9.9

CLONE TRIALS

Trial 1

1961 — Small-scale clone trial — Kuruwita

A Hamaker-Morris-Mann early tapping test was conducted in this area and the following clones were selected for tapping in 1966. All these clones showed a higher index than PB 86.

Clone	Parentage	Average girth	No. of trees
1305	RRIC 41 × Ch 26	14.6	6
*C 695	—	14.6	7
1222	Ch 26 × RRIC 36	13.8	4
1174	Ch 26 × RRIC 7	17.4	8
663	RRIC 52 × PB 86	16.1	10
*RRIC 89	—	10.5	63
254	Mil 3/2 × Tjir 1	15.9	7
1152	RRIC 45 × RRIC 13	14.8	5
TR 1406	Gl 1222 × Tjir 1	15.6	3
778	RRIC 52 × Tjir 1	17.0	2
316	Tjir 1 × RRIC 50	16.8	4
359	Tjir 1 × RRIC 50	16.5	8
266	Mil 3/2 × Tjir 1	17.6	9
771	RRIC 52 × Tjir 1	13.6	6
1295	RRIC 86 × RRIC 52	15.7	6
785	PB 5/139 × RRIC 52	19.3	3
1173	Ch 26 × RRIC 7	17.8	10
*ES 3	33/129 × RRIM 600	15.1	9
642	RRIC 52 × PB 86	13.3	9
708	PB 86 × RRIC 36	14.9	4
1251	Ch 26 × RRIC 52	18.8	3
1279	Ch 26 × RRIC 52	18.6	2
1157	RRIC 74 × Ch 26	16.7	3
1326	T 16 × RRIC 52	19.0	3
506	RRIC 52 × PB 86	15.9	9
734	RRIC 52 × Tjir 1	17.2	10
794	PB 5/139 × RRIC 52	17.1	4
82	RRIC 41 × RRIC 10	15.2	9
1256	Ch 26 × RRIC 52	18.5	5
885	PB 5/139 × RRIC 52	16.5	8
1290	RRIC 52 × RRIC 86	16.9	9
516	RRIC 52 × BP 86	14.6	3
841	PB 5/139 RRIC 52	12.1	6
539	RRIC 52 × PB 86	17.1	4
*1798	RRIC 45 × PR 107	16.4	8
1253	Ch 26 × RRIC 52	16.5	5
PB 86	(better grown selection)	11.7	100

* Planted 1961 N.E. : others planted 1961 S.W.

As the growth rate of most of these selected clones suggested an increase and in girth after commencement of tapping it was decided to take the better grown trees into routine tapping at S/2, d/3, 67% from 1966.

Trial 2

1961 — Medium and small-scale trial — Kuruwita

Four clones in this area which were of sufficient girth to be screened for yields on the Hamaker-Morris-Mann system showed very favourable results as shown in the previous paragraph.

Trial 3

1962 — Large-scale clone trial — Kuruwita

The girth measurements for this area were as follows:—

Clone	No. of plants	Girth in inches	Clone	No. of plants	Girth in inches
AVROS 529	123	8.3	RRIC 36	242	8.0
AVROS 2037	238	7.7	RRIC 37	133	6.8
Harbel 1	257	6.5	RRIC 41	122	10.1
IAN 45—717	225	7.3	RRIC 45	264	8.2
IAN 6497	119	6.1	RRIC 51	246	8.4
IRC 17	129	7.5	RRIC 52	276	9.4
IRCI 9	123	6.7	RRIM 607	242	6.4
PB 86	228	8.0	RRIM 623	254	10.7
PR 228	125	7.4	RRIM 628	176	5.3
PR 251	128	7.2	RRIM 701	249	10.0
PR 259	133	5.8	RRIM 707	244	7.4
RRIC 7	132	6.9	WR 101	119	9.1
RRIC 14	225	11.4	TR 3702	258	5.9
			TR 1548	247	6.8
Mean for area					7.7

Trial 4

1962 — Small-scale clone trial — Kuruwita

The girth measurements for this area were as follows:—

Clone	No. of trees	Girth in inches	Clone	No. of trees	Girth in inches
566	9	8.2	2028	8	8.9
759	9	7.4	2031	10	9.3
784	10	9.1	2124	10	10.2
815	10	10.7	IAN 6754	10	4.1
828	10	9.4	FX 3925	10	6.5
864	9	9.6	IAN 45—713	10	6.1
1009	9	7.8	PB 28/59	9	6.3
1018	9	8.4	RRIC 90	9	6.8
1103	9	8.5	RRIC 91	8	9.3
1108	9	10.1	RRIC 92	8	7.6
1141	9	10.1	RRIC 93	8	7.7
1317	10	8.4	RRIC 94	8	7.3
1458	10	11.8	RRIC 95	7	7.8
2002	9	10.3	RRIC 96	8	6.8
2005	10	8.3	RRIC 97	8	8.1

Trial 5

1962 — *Small-scale clone trial — Nivitigalakele*

The girth measurements for this area were as follows :—

Clone	Parentage	No. of plants	Girth in inches
82	RRIC 41 × RRIC 10	8	12.2
566	RRIC 52 × PB 86	10	10.1
759	RRIC 52 × Tjir 1	10	10.3
815	PB 5/139 × RRIC 52	10	10.7
1009	T 170 × RRIC 52	10	12.3
1103	RRIC 52 × RRIC 7	10	12.4
1317	RRIC 45 × LCB 1320	9	11.0
1458	LCB 1320 × RRIC 7	9	11.5
Harbel 1	—	9	8.6
IAN 6497	IAN 2818 (FX 516 × PB 86) × PB 86	9	8.6
PB 28/59	—	6	12.7
RRIC 7	—	9	9.6
RRIC 36	PB 86 × PR 107	10	9.9
RRIC 45	RRIC 8 × Tjir 1	10	10.4
RRIC 52	—	9	11.8
RRIM 607	Tjir 1 × PB 49	8	8.3
RRIM 707	RRIM 632 × RRIM 501	9	9.4
	Mean for area	155	10.5

Trial 6

1963 — *Small-scale clone trial — Kuruwita*. 111 plants of clone FX 614 and 125 plants of clone 1010 were planted where there were vacancies. It is expected that the very vigorous growth of these clones would result in a uniform planting in a few years.

Trial 7

1964 — *Clone trial — Kuruwita (S.W. and N.E. plantings)*

The growth in this area was found to be satisfactory.

Trial 8

1965 — Small-scale clone trial — Dartonfield

A small-scale clone trial consisting of 3 replications of 5 plants of each clone was planted in a 4½-acre area at Dartonfield during the South West monsoon. 30 five-tree plots of RRIC 45 were planted as the control. The other clones planted were as follows :—

Clone		Parentage
Selections from <i>Oidium</i> test area.		
IAN 45—710		PB 86 × F 409
566		RRIC 52 × PB 86
828		PB 5/139 × RRIC 52
864		” × ”
1010		T 170 × RRIC 52
1103		RRIC 52 × RRIC 7
1108		” × ”
Selections from <i>Phytophthora</i> test area.		
690		PB 86 × RRIC 52
691		” × ”
788		PB 5/139 × ”
1067		T 792 × ”
1142		LCB1320 × RRIC 45
1289		RRIC 52 × RRIC 86
1330		RRIC 52 × PB 86
1460		RRIC 52 × T 792
1461		” × ”
Nursery selections from hand pollinated progeny		
2412		RRIC 45 × FX 4098
2416		” × ”
2417		” × ”
2419		” × ”
2473		” × IAN 45 — 873
2479		” × IAN 45 — 873
2885		Ch 26 × RRIC 52
3101		RRIC 45 × Wagga 6278
3131		LCB 1320 × Wagga 6278
3134		” × ”
3151		” × LCB 1320
3164		” × RRIC 51
3185		Wagga 6278 × LCB 1320
3463		RRIC 52 × Wagga 6278
3585		RRIC 52 × LCB 1320
3895		Wagga 6278 × RRIC 52
3900		” × ”
5323		PB 28/59 × FX 516
5326		RRIC 51 × F 4542
5350		RRIC 52 × IAN 45 — 710
5352		” × ”
6182		PB 28/59 × IAN 45 — 873
6306		RRIC 36 × FX 516
8440		RRIC 52 × IAN 45 — 710
8595		RRIC 36 × RRIC 52
8768		H. spruc. × RRIC 51
Established clone RRIM 623		PB 49 × Pil B 84

Trial 9

1965 — Small-scale clone trial — Kumārāwatte — Moneragala

A replicated small-scale clone trial consisting of selections from the earlier Kumārāwatte trial and other suitable material was planted in a 5-acre area at Kumārāwatte Group, Moneragala, during the North East monsoon. Three 30-tree plots of RRIM 623, RRIC 45, IAN 45 - 710, and RRIC 89, were planted; the following clones were planted as replicated ten-tree plots.

Clone	Parentage	No. of ten-tree plots
828	PB 5/139 × RRIC 52	4
1103	RRIC 52 × RRIC 7	4
1108	“ × “	4
1068	Tjir 1 × Wagga 6278	3
1307	RRIC 41 × Ch 26	3
266	Mil 3/2 × Tjir 1	4
516	RRIC 52 × PB 86	4
1487	Nab 20 × RRIC 7	3
1923	RRIC 51 × LCB 1320	3
734	RRIC 52 × Tjir 1	4
1259	Ch 26 × RRIC 52	3
1010	T 170 × RRIC 52	3
444	RRIC 52 × PB 86	2
451	“ × “	3
1305	RRIC 41 × Ch 26	4
778	RRIC 52 × Tjir 1	3
1174	Ch 26 × RRIC 7	3

Trial 10

1965 — Medium-scale clone trial — Clodagh Group — Matale

Following up on the results obtained at Kepitigalla Group, and a screening of *Dothidella*-resistant progeny for *Oidium* resistance, a double density planting of approximately three twenty five-tree plots of each clone was carried out during the North East monsoon. The selections from Kepitigalla Group comprised clones 444, 1010, 451, 1108, 1004, 815, 828, 864, IAN 45 - 710, and control clone RRIC 52. The selections from Clodagh Group, 1963 planting, were as follows:—

Clone	Parentage
2317	RRIC 52 × AVROS 157
2413	RRIC 45 × FX 4098
2427	“ × “
2462	RRIC 88 × “
5329	IAN 3434 × RRIC 52
5334	“ × “
5997	RRIC 52 × IAN 2750
6004	“ × “
6005	“ × “
4011	“ × RRIC 52

HAND POLLINATION PROGRAMME

The hand pollination programme was conducted on two Divisions of Peenkande Group where suitable material was available. A satisfactory number of seedlings of the important cross IAN 45 - 710 × RRIC 45 was obtained. The number of sets in the case of the other crosses was rather low owing to ineffective control of *Gloeosporium* and *Phytophthora*. Therefore this programme would be repeated in this estate in 1966 and better control of fruit disease is expected with more experience of this area. The detailed results are given in Appendix I.

TABLE III
NO. OF POLLINATIONS
No. of fruits set

	IAN 45-710	IAN 45-717	IAN 45-873	<i>H. spruc</i>	RRIC 36	RRIC 45	RRIC 52
IAN 45-710	—	—	—	—	1858	6636	1013
					9	151	19
IAN 45-717	—	—	—	—	171	—	563
					1		3
IAN 45-873	—	—	—	—	808	3902	—
					9	38	
RRIC 36	—	540	79	—	—	—	—
		4	2				
RRIC 45	881	—	256	—	—	—	37
	3		6				1
RRIC 52	3664	1342	2783	48	3669	—	—
	9	4	7	1	27		

Number of unsuccessful crosses = 928.

EARLY FLOWER INDUCEMENT

The early flowering clone H 440 was multiplied and over 200 plants obtained for further studies in 1966. A few buds of this plant budded on to other plants flowered in one year but so far did not induce flowering in the other clone. Seed of this clone was collected and germinated for further observations.

EPIPHYTIC INDUCTION

An additional nursery was established in the Matale District in order to confirm early observations of *Oidium* susceptibility obtained in Nivitigalakele. The

seed obtained from the 1965 programme was planted out under epiphytotic conditions from the time of germination. A spell of very wet weather resulted in an incidence of *Gloeosporium* attack and the attacked plants were noted. The duration of this spell of wet weather was however not sufficient for further studies on *Phytophthora* infection.

NURSERIES

Approximately 12,000 hand-pollinated seedlings were labelled and maintained. Multiplication nurseries were opened for selections which would be progressively multiplied for use in large-scale trials.

INDEX TO TRIALS

- Trial 1* : 1961 — *Small-scale clone trial — Kuruwita*
- Trial 2* : 1961 — *Medium and small-scale trial — Kuruwita*
- Trial 3* : 1962 — *Large-scale clone trial — Kuruwita*
- Trial 4* : 1962 — *Small-scale clone trial — Kuruwita*
- Trial 5* : 1962 — *Small-scale clone trial — Nivitigalakelle*
- Trial 6* : 1963 — *Small-scale clone trial — Kuruwita*
- Trial 7* : 1964 — *Clone trial — Kuruwita (S. W. and N. E. plantings)*
- Trial 8* : 1965 — *Small-scale clone trial — Dartonfield*
- Trial 9* : 1965 — *Small-scale clone trial — Kumarawatte — Moneragala*
- Trial 10* : 1965 — *Medium-scale clone trial — Clodagh Group — Matale*
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APPENDIX I

HEVEA HAND POLLINATION PROGRAMME — 1965

Cross made	Parentage/origin	No. of pollinations	No. of seedlings
IAN 45—710 × RRIC 36	(PB 86 × F 409) × (PB 86 × PR 107)	1858	17
„ × RRIC 45	„ × (RRIC 8 × Tjir 1)	6636	362
„ × RRIC 52	„ × SS	1013	18
IAN 45—717 × RRIC 36	(PB 86 × F 4542) × (PB 86 × PR 107)	171	3
„ × RRIC 52	„ × SS	563	8
IAN 45—873 × RRIC 36	(PB 86 × FA 1717) × (PB 86 × PR 107)	808	24
„ × RRIC 45	„ × (RRIC 8 × Tjir 1)	3992	105
RRIC 36 × IAN 45—717	(PB 86 × PR 107) × (PB 86 × F 4542)	540	12
„ × IAN 45—873	„ × (PB 86 × FA 1717)	79	6
RRIC 45 × IAN 45—710	(RRIC 8 × Tjir 1) × (PB 86 × F 409)	881	9
„ × IAN 45—873	„ × (PB 86 × FA 1717)	256	15
„ × RRIC 52	„ × SS	37	3
RRIC 52 × IAN 45—710	SS × (PB 86 × F 409)	3664	9
„ × IAN 45—717	SS × (PB 86 × F 4542)	1342	10
„ × IAN 45—873	SS × (PB 86 × FA 1717)	2783	21
„ × <i>H. spruc.</i>	SS × SS	48	3
„ × RRIC 45	SS × (RRIC 8 × Tjir 1)	3669	73
	Total	28250	698

Number of unsuccessful crosses = 928

SS denoted selected seedling origin of unknown parentage.

PLANT PATHOLOGY DIVISION

By

O. S. PERIES

LABORATORY WORK

Diseased Specimens

The following diseases and pests were identified on specimens sent to the Institute in connexion with advisory work during the period under review:—

Identity of diseases, pests and other causes of damage	No. of Cases
(a) Fungi and Bacteria	
<i>Botryodiplodia theobromae</i>	4
<i>Fomes lignosus</i>	2
<i>Gloeosporium alborubrum</i>	6
<i>Oidium heveae</i>	4
<i>Phytophthora meadii</i>	1
<i>Ustilina zonata</i>	1
(b) Pests and other causes	
Genetic yellows	1
Mealy bugs	1
Mites	1
Physiological disorders	7
Scorch from spray drift	1
Scorch of budded stumps following application of Candarsan	1
Sun scorch	1
Total	31

BIOLOGY OF THE FUNGAL PARASITES OF *HEVEA*

Oidium heveae

Biology of spore germination.—(O. S. Peries, S. K. Samaraweera & D. A. Jayasekera). The results obtained in 1964 regarding the lethal effects of direct sunlight and ultra-violet light on *Oidium* conidia were confirmed during the 1965 *Oidium* season. The data on this subject are now being collated for the preparation of a paper on this study, so that there will be a permanent record of the available information on this subject.

Studies on the host range of *O. heveae* too have been concluded. It has been found that although powdery mildew fungi affect a number of different species of plants in Ceylon, these fungi are not generally cross transferable between the hosts, and that they are mostly host specific. The *Oidium* from *Hevea* can be transferred to *Eurphobia hirta*, but not *vice versa*. When the powdery mildew from *Hevea* is transferred to *Eurphorbia* a distinct change occurs in the morphology of the fungus. This has been described in a paper prepared for publication (Refer section on publications).

Studies on disease forecasting are continuing, laboratory studies have indicated that the causal fungus, *O. heveae*, is likely to be encouraged by conditions of comparatively low temperature and high humidity, whereas direct sunlight and free water on the leaf surface are likely to prove inimical to it. This indicates that severe attacks of *Oidium* leaf disease are likely to occur during cool, humid, overcast weather, but that bright, sunny, hot weather as well as continuous rain would tend to reduce disease intensity. Field observations have confirmed that *Oidium* leaf disease spreads rapidly during cool, dry weather, especially with an excess of dew in the nights and early mornings.

Phytophthora meadii

Biology of the fungus.—(O. S. Peries & T. M. Fernando). These studies were concluded during 1965, and the available data have been incorporated in a paper prepared for publication in an international journal (Please refer section on publications).

Studies on the growth of *P. meadii* and *P. palmivora* on defined media are being continued. It has been confirmed that Glucose, Fructose and Maltose are the best sources of carbon for the fungus, out of a total of seventeen sugars tested. The nitrogen and vitamin requirements of the fungi are being studied at present, on a total of thirty three nitrogen compounds and thirteen vitamins.

Distribution of the two sexually compatible types of P. meadii in Ceylon rubber estates.—(O. S. Peries & D. M. Dantanarayana). It has been found that both sexual compatibility types of *P. meadii* can often be isolated from the same estate. Both types have, in fact, been isolated from a single tree in at least one instance. Therefore, the chances of sexual reproduction of the fungus under Ceylon conditions are generally good, so that variation of the fungus can be expected to be high. The available data on this subject have been incorporated in a paper read at the 21st sessions of the Ceylon Association for the Advancement of Science (C.A.A.S.) held in December 1965. This paper will be published in the R.R.I.C. Quarterly Journal in the near future.

Physiologic specialization.—(O. S. Peries & D. M. Dantanarayana). On the basis of the infection pattern on seven clones inoculated with different isolates of the fungus, there are indications that at least five physiologic races of the fungus can affect *Hevea* in Ceylon. These inoculation experiments will be repeated a number of times to confirm these results, before they are published.

Perennation of the fungus.—(O. S. Peries, S. K. Samaraweera & D. M. Dantanarayana). The fungus has been isolated from mummified fruits and fruit stalks of the previous season, from the junction of dead and healthy tissue of infected twigs and branches, and from deep-lying tissue of the trunk in neglected cases of Bark Rot, where the lesions have repeatedly healed over in dry seasons.

Epidemiology of Phytophthora leaf diseases.—(O. S. Peries, S. K. Samaraweera & D. A. Jayasekera). The observations made during the 1964 *Phytophthora* season were confirmed. It was possible to carry out only a limited amount of work on the natural spread of *Phytophthora* leaf disease in the field, because of the extremely low incidence of this disease in Ceylon during 1965. However, this was compensated for, to a large extent, by carrying out a detailed study of the infection of pods and leaf stalks following artificial inoculation.

It has been found that pods are readily infected by inoculation with a zoospore suspension containing comparatively few zoospores, whereas leaf stalks require a highly concentrated suspension for successful inoculation. This confirms that the pod is the vital plant organ for the rapid dissemination of the disease, as pods are easily infected by even the occasional drop of water carrying a few zoospores. Once the pods are infected, large numbers of sporangia are produced on them and they provide the inoculum for the infection of leaf stalks. This is one of the reasons for the close relationship between pod-set and leaf-fall on individual trees, the pods produce the inoculum and, during rainy weather, the drip water from them repeatedly inoculates the leaf stalks below them with a highly concentrated suspension of zoospores. Samples of drip water collected from infected pods have shown that they contain sufficient zoospores for the successful inoculation of leaf stalks.

The 1965 South West monsoon season provided an opportunity for collecting further confirmatory evidence for the close correlation between pod-set and leaf-fall. June and July were comparatively dry sunny months in 1965, so that the weather conditions were not suitable for the development of the fungus. However, under those sunny conditions the pods developed rapidly and seed-fall occurred earlier than usual. Weather conditions became suitable for the rapid development of the fungus in mid-September; but by that time a majority of pods had fallen or dried out and *only* those trees still bearing infected green pods succumbed to leaf-fall. This correlation was extremely clear-cut, so much so that trees bearing infected green pods could be recognized from a distance in the field in September 1965, because of the discolouration of infected leaves.

The other important observation confirmed during the 1965 *Phytophthora* leaf disease season was that the fungal inoculum originating from any particular tree had a very restricted range. Trees bearing a large number of heavily infected pods and suffering from severe leaf-fall were regularly seen adjacent to others bearing few pods and suffering little damage. This correlation was clearly seen in September 1965, when few trees bore infected green pods so that this effect was quite distinct. The conclusion that may be drawn from this observation is that *Phytophthora* inoculum is dispersed mainly by rain splash under Ceylon conditions, and that wind is of relatively little importance as an agent of dispersal of this fungus.

Gloeosporium alborubrum

Biology of spore germination. — (D. L. S. Wimalajeewa). These studies have been completed and written up for publication.

Sporulation of the fungus during the course of the year. — (O. S. Peries & D. A. Jayasekera). This project was started in January 1965, and a weekly assessment was carried out to establish the intensity of sporulation of the fungus during the course of the year. It has been found that sporulation is greatest in the wet months of the year with peaks in July and November, but that there are considerable numbers of spores on infected leaves and twigs even during dry periods. This is one of the reasons for the success of this fungus as a pathogen, because spores are always available for rapid infection of susceptible tissue, when conditions are suitable for infection, even for short periods, during dry spells.

Effect of temperature on sporulation. (O. S. Peries & D. A. Jayasekera). Preliminary results from this study have indicated that the optimum temperatures for sporulation of the fungus are between 20 and 30°C, there being very little sporulation above 33°C and below 20°C.

Effect of stage of leaf development on infection pattern.— (O. S. Peries & D. A. Jayasekera). The percentage germination of spores on leaves does not generally vary, irrespective of the stage of development of the leaf. However, there is a marked difference in the pattern of infection; young copper brown leaves are highly susceptible to penetration and infection by the fungus, whereas mature leaves are immune to infection, although spores germinate and produce appressoria on them. There is a gradation in the amount of infection produced between the highly susceptible young leaves and the immune, fully mature leaves, the limp green leaves being partially resistant to infection.

Observation on leaf development.— (O. S. Peries & D. A. Jayasekera). The development of the rubber leaf was studied from bud-burst to maturity along with the above project, to establish the period during which leaves are susceptible to infection. It was found that rubber leaves generally take 14 to 16 days to become fully mature from the time of bud burst. The leaf is susceptible to infection by *G. alborubrum* to some degree for a maximum period of about 10 days from the time it unfolds.

Leaf surface wetness and infection.— (O. S. Peries & D. A. Jayasekera). Studies were carried out to establish the amount of time the leaf surface has to remain wet for infection to occur at various temperatures. The results are tabulated below :—

TABLE I

PERIOD THE LEAF MUST REMAIN WET FOR INFECTION TO OCCUR
AT DIFFERENT TEMPERATURES

Temperature °C	Period of leaf wetness required
30	No infection
27	2 hrs. (infection scattered)
25	2 hrs. (optimum temperature, heavy infection)
20	4 hrs.
15	No infection

HOST-PARASITE RELATIONSHIPS

Phytophthora meadii

Phytophthora infection of bark.— (O. S. Peries & T. M. Fernando.) Inoculations were carried out at monthly intervals throughout the year in an attempt to define the periods of the year when Bark Rot infections are likely to occur. The results, available up to date, indicate that *Hevea* bark can be infected whenever inoculum is available and the bark is injured, irrespective of the time of year or the weather conditions prevailing at the time of inoculation. Intact bark is immune to infection. This shows the importance of one aspect of avoiding Bark Rot infection, which this Institute has been advocating over the last 4 years, *i.e.* the necessity to avoid the tapping of wet trees. It must be clearly understood that *Phytophthora* spores are always likely to be present in water running down the tree, and trees tapped in wet weather are always liable to become infected by these spores.

Histological studies.— (O. S. Peries & Z. E. Irugalbandara). The studies on the pathological anatomy of infected bark, petioles and pods were continued during the year. The progress in these studies has been satisfactory, the subject being a difficult and tedious one; as *Phytophthora* appears to be quickly followed by bacteria in infected tissue.

Anatomy of bark and clonal susceptibility to Bark Rot.—(O. S. Peries & Z. E. Irugalbandara). The anatomy of the bark of seven clones was studied in detail to establish whether there is any correlation between bark characteristics and susceptibility to Bark Rot, as this could help in the early detection of clones resistant to this disease. It was found however, that there was no correlation between the thickness of bark, size of medullary rays, size of parenchyma cells, depth of stone cell layer, number of crystal bearing cells and number of latex vessels on the one hand and susceptibility of Bark Rot on the other.

Moisture content of bark and susceptibility to Bark Rot.—(O. S. Peries & T. M. Fernando). The turgor pressure of the bark of seven clones was assessed by the method recommended by Bier (1959). It was found that there was no correlation between this factor and clonal susceptibility to Bark Rot.

Analytical studies on Bark.—(O. S. Peries & T. Shanmuganathan). The phenol nitrogen and amino acid contents of the bark of seven clones were determined. There was no significant relationship between phenol and nitrogen contents of the bark and susceptibility to Bark Rot. The studies on amino acid content of the bark are in progress.

Isolation of fungus from infected bark.—(O. S. Peries & D. M. Dantanarayana). Studies are in progress to define the periods of the year when Bark Rot is likely to spread in the field, by isolating the causal fungus periodically, throughout the year, from affected bark. These studies will help to effect economies in the use of fungicides for Bark Rot control, by confining the use of fungicides only to periods when the fungus is likely to be active in the field.

Susceptibility of Hevea roots to Phytophthora infection —(O. S. Peries & D. A. Jayasekera). The roots of plants growing in water culture solution were inoculated with zoospores of *P. meadii*. It was found that young roots are readily infected by the fungus, but the infection does not spread. The plant recovers after some time by putting out new rootlets.

Gloeosporium alborubrum.

Clonal susceptibility to Gloeosporium leaf disease.—(O. S. Peries & D. A. Jayasekera). Further studies, consisting of laboratory investigations and field observations, are being carried out to establish the susceptibility of various clones to *Gloeosporium* leaf disease, so as to confirm the results obtained last year and to widen the scope of this investigation to cover more clones.

Bark cracking

Electron microscope examination of serum.—(O. S. Peries & T. Shanmuganathan). A number of samples of serum from young PB 86 trees showing severe symptoms of bark cracking were despatched by special air-freight to the Rothamsted Experimental Station, England, so as to reach the destination within 48 hrs. of extraction of the serum. These samples were examined under the electron microscope at Rothamsted, but due to the time lag between extraction and examination, the results have been disappointing so far. It has now been decided to despatch freeze-dried extracts to Rothamsted.

Fungicides

Fungicides for Bark Rot control.—(O. S. Peries & D. M. Dantanarayana). Two new fungicides were tested for Bark Rot control by the standard methods used by the Institute. The results are tabulated below:—

TABLE II
RESULTS OF TESTS OF FUNGICIDES FOR BARK ROT CONTROL

Name of fungicide	Active ingredient	Fungicidal level	Phytotoxic level
Santar	... 3% yellow mercuric oxide	0.01%	Not phytotoxic when applied neat
Daconil 2787	... 75% tetrachloroisophthalonitrile	Not fungicidal at 1%—not water-miscible	Work in progress

Fungicides for root disease control.—(O. S. Peries & T. Shanmuganathan). Fomac 2, a new fungicide based on Pentachloronitrobenzene (PCNB), is being tested for the prevention of infection of rubber roots by *Fomes lignosus*. This material has given encouraging results to-date.

Fungicides for Gloeosporium leaf disease control.—(O. S. Peries, W. C. Dayaratne & T. Shanmuganathan). These studies were continued and the effect of mercury and nickel on the leaf surface upon the germination of *Gloeosporium* spores was investigated. It was found that mercury is a potent fungicide against *Gloeosporium* killing the spores at very low concentration. This material is also rapidly absorbed by various parts of the plant and quickly redistributed, so that even sections of the plant that were not treated by the fungicide are protected by translocated mercury, within a few hours of application of the fungicide to the plant.

Fungal cultures

Despatch of fungal cultures.—(D. M. Dantanarayana). Four cultures of *Phytophthora* spp., isolated from various crops, were received at the Institute from the Department of Agriculture, Peradeniya. These cultures together with 58 cultures from the R.R.I.C. collection were sent to Prof. Frank A. Hassis, North Carolina State University, Raleigh, U.S.A., for studies on variation in *Phytophthoras* isolated from *Hevea*. This is an academic study, which cannot be undertaken at this Institute for the present. Therefore we are grateful to Prof. Hassis for kindly consenting to help us with this work, the results of which will help us to understand the variations in *Phytophthora* infection patterns each year.

Soil microflora

Soil microflora and root disease incidence.—(O. S. Peries, H. L. Munasinghe & S. K. Samaraweera). Pot experiments are being carried out to establish the effect of the addition of three levels of sulphur and Tillex, in comparison with untreated controls, on *Fomes* food bases in the soil. Preliminary results have indicated that sulphur tends to reduce the incidence of all varieties of fungi in the soil except *Trichoderma* spp. and that Tillex suppresses the growth of all fungi. The 1964 experiments showed that copper inhibits the growth of all fungi except *Penicillium* spp. Rubber wood appears to rot faster in sulphur-treated soil than in Tillex-treated or untreated soil. The latter is an important observation and if confirmed would be a valuable contribution towards the control of White Root disease in *Hevea*.

Soil microbiology in rubber plantations.—(H. L. Munasinghe). These studies, commenced in 1964, are being continued. A number of fresh soil samples have been studied to establish the seasonal variations of fungal populations in the soil under *Hevea*.

A detailed study is being carried out to determine the specific distribution of fungi in the rhizosphere of a healthy rubber plant and one infected by *Fomes*. This will give an indication of the type of soil amendment which may be useful in suppressing the incidence of *Fomes*.

Fomes lignosus

The effect of bark on the rate of infection of wood by Fomes.—(O. S. Peries & S. K. Samaraweera). Pure culture experiments (Peries & Samaraweera 1963) have been started to assess the effect of the bark on the infection and rate of decay of rubber wood in the soil, and to determine the competitive saprophytic ability of *F. lignosus* to colonise rubber wood with and without bark.

LEAF DISEASE

Oidium leaf disease

General.— Wintering was very uneven during the *Oidium* leaf disease season ; some clones started wintering in November 1964, but others wintered in late April, 1965, with the result that *Oidium* infection was rather heavy during March and April 1965, when weather conditions were conducive to the propagation of the causal fungus.

Phytophthora leaf disease

General.— The weather was generally warm and sunny in June and July 1965, with the result that the incidence of *Phytophthora* leaf disease was negligible during the 1965 South West monsoon season. There was clear evidence this year again that rubber pods provide the inoculum for the leaf-fall phase of the disease. The majority of pods shed seed early this year, because of the hot sunny weather prevailing in June and July. Weather conditions became suitable for *Phytophthora* infection only in the second half of September, and some leaves fell due to infection by the fungus, but this was negligible and confined to trees still bearing green pods, affected by the fungus.

Gloeosporium leaf disease

General.— The incidence of *Gloeosporium* leaf disease was low throughout the period under review.

BARK AND STEM DISEASES

Bark Rot

General.— The incidence of Bark Rot was generally low during the year, except in isolated cases where the disease had got out of hand, because of failure to eradicate it in its early stages. It is quite clear now that, if the disease is detected in its initial stages and remedial action is taken immediately, this disease can be kept under control even in bad years. One of the most important precautionary measures to reduce the incidence of the disease is to ensure that wet trees are never tapped.

Field experiments.—(O. S. Peries, E. G. Mendis, T. M. Fernando & W. C. Dayaratne). Three more long-term field experiments (Field Experiments Nos. 3, 4 and 5) for the control of Bark Rot were started during the year, to determine the lowest effective concentration of various fungicides and the best combination

of watermiscible and water-proof fungicides for use on clones of different susceptibilities to the disease. The results of these experiments would enable the Institute to recommend the most economical fungicides for use on the different types of clones planted in Ceylon.

Two other experiments (Field Experiments Nos. 1 and 2) started earlier were continued, and regular records were maintained on the incidence of the disease in these areas. However, the number of trees infected by the fungus was so low in all the experimental areas during 1965 that no conclusions can be drawn from the results obtained during the period under review.

One important observation that has been made during the course of these experiments is that clone PB 86, which is highly susceptible to the disease, can survive for a number of years, under certain circumstances, without any apparent ill-effects, in the absence of the use of a water-proof dressing on the tapping panel. This shows that the problem of the use of a water-proof panel dressing for Bark Rot control must be carefully investigated. Steps are being taken to elucidate this problem by carrying out a series of carefully planned experiments.

A census is being taken on all Bark Rot experimental areas, at monthly intervals, to establish the periods of the year during which the danger from Bark Rot infection is most serious. At present it is generally accepted that the two monsoon seasons are the danger periods, but there are no data available to show the type of weather conditions which are most suitable for the spread of the infection from tree to tree in the field.

The method of treatment of Bark Rot.—(O. S. Peries; H. L. Munasinghe & S. K. Samaraweera). Two experiments were laid down during the period under review to determine the amount of scraping of infected bark and wood that is necessary for the control of Bark Rot on heavily infected trees.

The effect of fungicides on yield of latex.—(O. S. Peries; S. K. Samaraweera & Z. E. Irugalbandara). The preliminary results from experiments laid down in 1965, to test the effect of fungicides on latex yields, have indicated that all fungicides can depress yields; if applied before the commencement of tapping. This is an important factor, and should be confirmed by further trials. These studies are being continued.

Pink disease

General.—The incidence of this disease was negligible during the course of 1965, a few cases being observed on some susceptible clones planted in wet districts.

ROOT DISEASES

White Root disease

General.—The general advisory correspondence on the subject indicates that the incidence of White Root disease, caused by the fungus *F. lignosus*, was high in the wetter rubber-planting districts of the Island.

Effect of treatment of soil with sulphur on disease incidence.— (O. S. Peries & S. K. Samaraweera). Preliminary results from this experiment (Field Experiment No. 9) are tabulated below:—

TABLE III
NUMBER AND PERCENTAGE OF *FOMES*-INFECTED PLANTS IN PLOTS
TREATED WITH SULPHUR AND CONTROLS

Blocks	6 plots treated with S.	6 control plots
A	117 (9.8%)	288 (24%)
B	103 (8.6%)	237 (19%)
Total	220	525

The above results indicate that the treatment of planting holes with sulphur can substantially reduce the incidence of *Fomes*.

The writer observed in one estate that, the sulphur had been placed in the alavangoe hole made for the tap root of the plant. This is incorrect, and will lead to death of plants as a result of acid scorch. The sulphur should be sprinkled on the surface of the soil and dibbled in with a garden fork or similar implement. Care must be taken to see that no more than 1/4 lb of sulphur is used per planting hole. High dosages of sulphur can be toxic to rubber roots.

Methods of identification and treatment of Fomes.— (O. S. Peries). The three long-term experiments (Field Experiments Nos. 6, 7 and 8) were continued. The purpose of these experiments is to establish the most economical method of identification and treatment of *Fomes*-affected trees.

Effect of different manurial treatments on incidence of Fomes.— (O. S. Peries). This experiment, carried out at Kuruwita Sub-station in close co-operation with the Soils Chemistry Division, was given routine attention by the Soils Chemistry Division.

COVER CROPS

Rhizobia

Rhizobial strains for nitrogen fixation in leguminous covers.—(H. L. Munasinghe) Cultures of selected strains of *Rhizobia* were issued free of charge to estates on request.

Laboratory and pot experiments were carried out to select new strains of effective *Rhizobia* for use under Ceylon conditions. These studies will be repeated, as the first two trials did not give any useful results.

FIELD EXPERIMENTS

Dartonsfield

One acre 1953 replanted area — Routine attention (weeding, manuring and pruning) was given to this area.

• AGRICULTURAL ENGINEERING

GENERAL

Leaf disease control

Oidium leaf disease.— (O. S. Peries, D. L. S. Wimalajeewa, E. G. Mendis, T. M. Fernando, S. K. Samaraweera & W. C. Dayaratne). The details regarding the seven randomized block experiments that were carried out on commercial estates during the 1965 refoliation season are tabulated below :—

TABLE IV
DETAILS OF FIELD EXPERIMENTS CARRIED OUT FOR *OIDIUM* CONTROL

Expt.	Field expt. No.	Estate	Clone and year of planting	Plot size (acres)	No of treatments	No. of replicates	Results of experiments
1	10	Culloden	Tjir 1 (1947)	3	3	3	Significant
2	11	Culloden	Tjir 1 (1946)	2	4	4	Not significant
3	12	Culloden	PB 86 (1952)	2	3	3	Not significant
4	13	Malaboda	PB 86 (1951—53)	1	4	4	Significant
5	14	Eladuwa	PB 86 (1951)	2	4	4	Significant
6	15	Eladuwa	Tjir 1 (1947)	1.5	3	3	Not significant
7	16	Neuchatel	BD 5 (1938)	1.5	3	3	Not significant

Experiment 1. (E. G. Mendis). This experiment carried out on clone Tjir 1, was designed to compare two different rates of dusting, 10 lb and 6 lb. per acre per week against an untreated control. The purpose of the experiment was to establish the maximum dosage of sulphur to give effective control of *Oidium* leaf disease on susceptible clones in the wet low-country districts of Ceylon. The results of the experiment are presented in Table V.

TABLE V
LEAF-FALL DUE TO *OIDIUM* IN AREAS DUSTED AT TWO DIFFERENT RATES

Treatments	Mean leaf fall	L.S.D.
A Control	40265	±9930 at 5%
B 10 lb S/ac. round/week	15483	
C 6 lb S/ac. round/week	26952	

These results indicate that even 6 lb of sulphur per acre per round, at weekly intervals, can reduce the incidence of *Oidium* significantly on Tjir 1, although 10 lb per acre per round would give very much better control of the disease. There were no significant difference in yields between the three treatments, however, and it is essential to carry out this type of experiment over several years before any firm recommendations can be made on the basis of these results, as the cumulative effects of repeated defoliation over a number of consecutive years on the health of the tree and its yield must be established first.

Experiment 2. (E. G. Mendis). This was a combined *Oidium* and *Phytophthora* control experiment to assess the effects of each of these diseases separately and the two in combination on the yield of latex from a clone, Tjir 1, susceptible to *Oidium*. This type of experiment is described in detail by Peries (1965). The results of this experiment were non-significant this year, there being very little leaf-fall throughout the experimental area, including the untreated control plots. Therefore, this experiment will not be discussed any further in this review.

Experiment 3. (T. M. Fernando). This experiment was carried out to compare the effectiveness of sulphur dusting with that of wettable sulphur spraying for *Oidium* control on clone PB 86. The incidence of the disease was extremely low in this experimental area too, and as the results of the experiment were non-significant they will not be discussed here.

Experiment 4. (T. M. Fernando). The effects of dusting early and late in the season and of a restricted dusting programme on clone PB 86 were compared against a control in this experiment. The results are summarized in Table VI below.

TABLE VI
LEAF-FALL DUE TO *OIDIUM* IN AREAS RECEIVING DIFFERENT SULPHUR DUST
TREATMENT PROGRAMME

Treatments	Mean leaf-fall	L.S.D.
Control-No S	2516	—
2 rounds of S at 8 lb/ac/round weekly from 13-3-65 - 20-3-65	1730	± 1100 at 5%
4 rounds of S at 8 lb/ac/round weekly from 13-2-65 - 6-3-65	899	—
4 rounds of S at 8 lb/ac/round weekly from 27-2-65 - 20-3-65	1189	—

Leaf-fall caused by *Oidium* was low throughout the experimental area. However, the results indicate that sulphur dusting can reduce *Oidium* leaf disease significantly, and that it is generally better to dust early in the season, at bud-burst, rather than later *i.e.* between 2 and 4 weeks after bud-burst.

Experiment 5. (W. C. Dayaratne). This was also a combined *Oidium* and *Phytophthora* leaf disease control experiment, like Experiment 3 above, but carried out on clone PB 86, tolerant to *Oidium* and susceptible to *Phytophthora* leaf disease. The results of this experiment are tabulated below :—

TABLE VII

LEAF-FALL CAUSED BY *OIDIUM* INFECTION IN COMBINED
OIDIUM/*PHYTOPHTHORA* EXPERIMENT

Treatments	Mean leaf-fall	L.S.D.
Control — no control of both diseases	11921	—
<i>Oidium</i> control only (8 lb S/ac/round, 4 rounds)	3698	±10212 at 5%
<i>Phytophthora</i> control only — No S dusting	17058	—
<i>Oidium</i> and <i>Phytophthora</i> control (8 lb S/ac/round, 4 rounds)	6468	—

The leaf-fall in this experimental area was higher than in Experiments 3 and 4 where the same clone, PB 86, was concerned. The results indicate that sulphur dusting can reduce *Oidium* infection significantly. It is interesting to observe that there has been more leaf-fall in areas protected against *Phytophthora* and not against *Oidium* than in the control areas, which were not protected against either disease.

Experiment 6. (W. C. Dayaratne). The purpose of this experiment was to compare the effects of dusting early and late in the season on the incidence of *Oidium* leaf disease on clone Tjir 1. Dusting commenced on 25th January 1965 on the areas treated early and on 8th February on the areas treated late. In both cases the rate of dusting was 10 lb. of sulphur per acre per round at weekly intervals for six rounds. The leaf-fall was uniformly high throughout the experimental area, and there was no significant difference between the different areas.

Experiment 7. (S. K. Samaraweera). This was a swath width experiment to determine the maximum number of rows of rubber trees that can be protected by each run of the dusting machine. In this experiment carried out on clone BD 5, the effectiveness of a six and a two-row swath was compared with an untreated control. The leaf-fall throughout the experimental area was very low, and there was no significant difference in the number of diseased leaves that fell in treated and untreated control areas.

Phytophthora leaf disease control.— (O. S. Peries, E. G. Mendis, T. M. Fernando & W. C. Dayaratne). Six field experiments (Field Experiments Nos. 19, 20, 21, 22, 23 and 24) were laid down prior to the beginning of the South West monsoon season; two of these were the combined *Oidium* and *Phytophthora* control trials described above, (Field Experiment Nos. 11 and 14) two others were essentially formulation assessment trials comparing dusting and spraying materials. The last two experiments were designed to establish the optimum swath width for copper dusting.

The incidence of the disease was so mild in 1965 that in a majority of cases the experimental areas were not treated at all and in others only one or two rounds of treatment were carried out. None of the experiments gave significant results.

Table VIII gives the rainfall figures for the months May to September (inclusive) 1965 at the three Divisions of the R.R.I.C. Estate. This table shows that June and July were comparatively dry months, and this is the main factor which militated against the development of the fungus. The conditions for fungal growth improved in September 1965, by which time most pods had fallen or dried, so that there was no inoculum available to cause heavy leaf-fall.

TABLE VIII

RAINFALL RECORDED ON DARTONFIELD GROUP, MAY — SEPTEMBER, 1965
AS COMPARED TO THAT IN 1959, A BAD *PHYTOPHTHORA* YEAR AND THAT OF
THE 5-YEAR AVERAGE

Month	Dartonfield			Nivitigalakele			Hedigalla		
	5 yr. av.	1959	1965	5 yr. av.	1959	1965	5 yr. av.	1959	1965
May	18.66	16.08	27.37	19.10	18.53	23.30	20.22	18.22	31.31
June	15.94	28.30	9.40	16.80	32.71	7.17	19.11	34.40	11.18
July	12.61	12.79	7.91	11.72	15.52	8.11	12.13	14.90	4.40
August	9.98	14.59	25.40	10.16	16.93	19.92	13.66	16.75	17.63
September	12.07	19.16	26.13	12.22	18.10	20.07	13.22	22.07	19.29

Gloeosporium leaf disease control.— (O. S. Peries, D. L. S. Wimalajeewa & T. Shanmuganathan). The long-term experiment, (Field Experiment No. 17) started in 1963, to determine the effect of *Gloeosporium* leaf disease on growth and yield of rubber trees of clone PB 86 was continued.

A formulation trial (Field Experiment No. 18) as well as one to determine the optimum period for the application of fungicides, were started during 1965 and are being continued.

Other field trials

Susceptibility of different root-stocks to Fomes infection.— (O. S. Peries). A nursery was planted up with different clonal rubber seedlings. These will be artificially inoculated with *Fomes* later on, to determine whether there is any difference in susceptibility of various clonal root-stocks to infection by White Root disease.

Hirst spore trap.— (O. S. Peries & T. M. Fernando). The studies on the fungal spore distribution, in the atmosphere in rubber-growing areas, were continued.

Leaf surface wetness recorder.— (H. L. Munasinghe). This apparatus was calibrated, after much effort, to record the periods during which the leaves remain wet in different seasons of the year. The information is of vital importance in the study of the incidence and spread of all leaf diseases of plants.

Bat damage.— (O. S. Peries & E. G. Mendis). An experiment was carried out to establish whether bat damage, to leaves of clone Gl 1, can be restricted by the application of copper sprays to the foliage of this clone. This experiment showed that bats will continue to feed on the leaves of Gl 1, even after the application of copper sprays.

FORMULATION ASSESSMENTS

Effectiveness of various stickers.—(O. S. Peries & W. C. Dayaratne). Copper fungicides are generally very easily washed off leaf samples (Lloyd, 1963). Therefore, it is essential to use additives with these fungicides to increase their tenacity of leaf surfaces. Various stickers were tested for this purpose by the method described by Peries (1965). It was found that this was a subject worthy of careful investigation, as there is always a danger that a sticker can be so effective that it prevents the solution and redistribution of the fungicide on the leaf surface after application. This reduces the efficacy of the fungicide, as each droplet of it would have only a very limited range of activity, and unless a spore falls on the droplet of the fungicide it would not be killed.

On the basis of the above results, it has been concluded that it would be necessary to test the properties of all stickers, by the methods developed at this Institute, before they are used in the field.

Efficacy of organo-mercurial sprays.—(O. S. Peries & W. C. Dayaratne). Laboratory and small-scale field trials were started to test the toxicity of various organo-mercurials to *Gloeosporium* spores. These studies are being continued.

Assessment of mercury in bark and leaves.—(O. S. Peries & T. Shanmuganathan). The apparatus required for carrying out these studies has been assembled, and work is in progress.

MACHINERY AND APPLICATION

Testing of spraying machines.—(D. L. S. Wimalajeewa, E. G. Mendis & W. C. Dayaratne). Three new machines were tested during the year, and gave encouraging results. The firms supplying the machines were invited to discuss the performance of the latter in detail with this Institute, and they were given suggestions on various points for improving the performance of their machines.

FIELD SURVEYS

*Survey of *Gloeosporium* leaf disease incidence.*—(O. S. Peries & T. Shanmuganathan). This survey was continued over 1965, and the results obtained are being collated for the preparation of a paper on this subject.

*Oidium and *Phytophthora* questionnaires.*—(O. S. Peries & E. G. Mendis). These questionnaires were distributed through Agency Houses to estates, and the replies were carefully analysed. The consensus of opinion amongst planters appears to be that the 1965 *Oidium* season was of above average severity, but the *Phytophthora* leaf and bark diseases were of negligible importance during the year.

INDEX TO FIELD EXPERIMENTS

1. Bark Rot control — fungicide trial (PB 86) — Malaboda Estate, Matugama
2. Bark Rot control — fungicide trial (PB 86) — Ellakande Estate, Horana
3. Bark Rot control — fungicide trial (Wagga 6278) — Malaboda Estate, Matugama

4. Bark Rot control — fungicide trial (Gl 1) — Siriniwasa Estate, Waga
5. Bark Rot control — fungicide trial (PR 107) — Delkeith Estate, Latpandura
6. Root disease control — method of identification — 13 acres 1961 — Dartonfield
7. Root disease control — method of identification — 9½ acres 1961 — Dartonfield
8. Root disease control — method of identification — 7½ acres 1961 — Dartonfield
9. Root disease control — effect of sulphur in soil — Gallawatte Estate, Agalawatta
10. *Oidium* leaf disease control — rates of dusting (Tjir 1) — Culloden Estate, Neboda
11. Combined *Oidium* and *Phytophthora* control — effect of leaf diseases (Tjir 1) — Culloden Estate, Neboda
12. *Oidium* leaf disease control — comparison of sulphur dusting with wettable sulphur spraying (PB 86) — Culloden Estate, Neboda
13. *Oidium* leaf disease control — time of dusting (PB 86) — Malaboda Estate, Matugama
14. Combined *Oidium* and *Phytophthora* control — effect of leaf diseases (PB 86) — Elladuwa Estate, Matugama
15. *Oidium* leaf disease control — time of dusting (Tjir 1) — Elladuwa Estate, Matugama
16. *Oidium* leaf disease control — swath width experiment (BD 5) — Neuchatel Group, Neboda
17. *Gloeosporium* leaf disease control — effect of *Gloeosporium* on growth (PB 86) — Gallawatte Estate, Agalawatta
18. *Gloeosporium* leaf disease control — fungicide trial (PB 86) — Nakiadeniya Group, Nakiadeniya
19. *Phytophthora* leaf disease control — formulation assessments (PB 86) — Ellakande Estate, Horana
20. *Phytophthora* leaf disease control — formulation assessments (PB 86) — Yatadola Estate, Matugama
21. *Phytophthora* leaf disease control — swath width experiment (PB 86) — Malaboda Estate, Matugama
22. *Phytophthora* leaf disease control — swath width experiment (Tjir 1) — Culloden Estate, Neboda

SOILS CHEMISTRY DIVISION

By

A. J. JEEVARATNAM

GENERAL

A special visitor to the division during the period was Dr. B. P. Ruxton of the Land Research Division of C.S.I.R.O., Canberra, Australia, who was one of the officers who conducted the Geomorphology Course arranged by UNESCO in Ceylon. He paid a special visit to the Institute at the request of the Soils Chemist who attended the course to discuss the soil survey work in progress at the Institute.

Soil samples were collected from Hunuwella Group, Opanaika and Palm-garden Group, Ratnapura and sent to the I.R.C.V. in response to a request for representative samples of two types of soils from Ceylon.

Members of the Soil Chemistry Division staff have been responsible for recording meteorological observations throughout the year on a rota basis.

Exhibitions

Models illustrating different systems of planting rubber to demonstrate the advantages of an improved system of planting on the contour were prepared and displayed at the Industrial Exhibition.

A panel consisting of different kinds of rock types and miniature monoliths of different types of soil profiles on which rubber is grown in Ceylon were prepared and displayed at an exhibition organised at the Agalawatta Maha Vidyalaya.

ADVISORY

General recommendations

The revision of the advisory circular on manuring was postponed, as it was felt that it would be better to await the results of investigations in progress for a further period before making a comprehensive revision of the Institute's recommendations. It was therefore decided, as an interim measure, to reprint Advisory Circular No. 66 on manuring and to include revisions on fertilizer recommendations that have since been made as an appendix in the same circular.

The preparation and release of an advisory circular on the use of herbicides for weed control in rubber plantations was also postponed until such time as the contemplated changes in regard to ground cover policies were finalised.

Specialised advice

Every effort was made to execute the specialised advisory function of the division through the medium of correspondence. Questionnaires on "Backward Growth" and "Poor Yields" which were sent to producers who sought advice on such problems proved very helpful in this connexion.

Visits for advisory purposes were confined to twenty holdings in all ; 8 by the Head of the Division, 2 by Head of the Division and Soils Chemist ; 7 by the Soils Chemist and 4 by the Assistant Soils Chemist.

Of these, eleven were concerned with instances of backward growth and/or unusual foliar symptoms. The causes for backward growth were invariably due to degraded soils and exposure to wind at the tops of hills. Poor soil conditions were found to be the cause for the occurrence of unusual foliar symptoms in two instances, and difficulty experienced in establishing ground covers in another.

One instance of unusual foliar symptoms turned out to be a case of Boron toxicity resulting from the incorporation of a Boron compound in the fertilizer mixture applied to young plants.

RESEARCH INVESTIGATIONS

Soil surveys (Mr. C. G. Silva)

Soil survey of rubber-growing areas — Semi-detailed reconnaissance level

The project of surveying the soils in the rubber-growing areas at a semi-detailed reconnaissance level was continued.

Detailed soil survey of rubber holdings

The area covered by the Ambalangoda one inch sheet was completed during the period under review. Work on the second phase of the survey programme, namely the detailed survey of rubber holdings, was also initiated concurrently. This was commenced on an estate holding in Kegalle District by way of a trial undertaking with the added objective of determining whether such surveys would be useful in ascertaining the causes for the variations in the yielding capacity of the same clonal material in different fields of the same estate, which variation could not be ascribed to any of the other factors that invariably contribute to variation in yield.

In carrying out the detailed survey it was realised that while it was a time consuming undertaking, the usefulness of such a survey of this nature would be limited unless it was accompanied by a contour survey as well, in view of the highly dissected nature of the terrain. Contour surveying being a specialised job in itself which cannot be undertaken without trained personnel, a relief survey of a section of the estate was carried out by way of a trial undertaking.

A detailed survey of sections of an estate holding in Kalutara District was also undertaken on a request made by the estate.

Maps of the areas surveyed have been prepared.

114 soil samples were collected for laboratory investigations in connexion with the different surveys.

Laboratory investigations

(1) *Analysis of soil-samples collected during the field surveys*

Analyses of soil samples collected during field surveys were undertaken by members of the soil survey team, between spells of field work.

The following determinations were carried out.

pH	...	...	...	...	...	95
Mechanical analysis	...	...	...	...	...	4
Nitrogen	...	...	...	...	...	95
Phosphorus	...	...	...	...	...	95
Potassium	...	...	...	...	...	95
Moisture	...	...	...	...	...	4
Cation exchangeable capacity	...	...	...	...	...	2
Total exchangeable bases	...	...	...	...	...	2

(2) *A study of the potassium status of some soils in the rubber-growing areas of Ceylon* (R. S. John)

General information regarding the soils studied was obtained by carrying out determinations of mechanical composition, cation exchange capacity, and total exchangeable bases on bulked samples from different sampling points.

(3) *Mineralogical composition of Micaceous soils* (C. G. Silva)

The clay, silt and fine sand fractions from samples of micaceous soils were separated and six fractions were forwarded to the University of Hawaii for x-ray defraction and differential thermal analysis.

(4) *Nutrient status of rubber leaves receiving different fertilizer treatments*

395 Leaf samples were collected from twelve experimental areas receiving different fertilizer treatments for purposes of determining the status of all the macro and a few of the micro nutrients in such leaves, with the object of improving the techniques of physiological diagnosis in the determination of manurial requirements.

The following determinations were carried on the leaf samples during the year.

N	P	K	Ca	Mg	Cu	Mn	B
196	159	240	218	218	204	132	3

(5) *Analysis of wood ash and fish meal*

Two samples of dried fish that was available at cheap rates in the local market were analysed for their suitability as manure for rubber areas, at the request of a producer.

The two samples forwarded to this Institute for analysis gave the following assay :

	Sample A	Sample B
Nitrogen %	6.09	10.36
Phosphorus %	1.16	2.16
Potassium %	1.07	0.67
Calcium %	2.11	3.98
Chlorine expressed as NaCl %	2.8	2.7
Loss on ignition %	73	64

Investigations were commenced on two samples of wood ash sent by another producer for the same purpose.

FIELD EXPERIMENTS

A total of twenty field experiments were in progress during the year.

The 20 experiments in progress in 1965 have each been assigned a number, an index of the experiments being given at the end of the report.

Results and/or observations on results from the different experiments in progress are reported individually or under appropriate grouping as deemed desirable.

Results of experiments 11, 14, 16 and 18 are not reported in this review due to unavoidable delays in recording and summarising girth data in time for statistical computation of the results. This was entirely due to the staff changes that had to be effected at the request of the Visiting Superintendent of the R.R.I.C. Sub-station at Kuruwita.

Experiment 1

Trial of N and K in presence of P on four clonal materials

13½ acres — new planting 1952 — Hedigalla

1965 fertilizer application according to treatments from the time of commencement of tapping was given as scheduled. Girth measurements of individual trees were recorded early in the year. Yield trends were assessed by carrying out two test tappings per month.

The girth and yield records for 1964 which was the sixth year of tapping coinciding with the sixth year of application of fertilizers according to converted treatments are summarised in Tables I and II.

TABLE I
GIRTH IN INCHES IN 1964

	O	Original treatments P	NP	PK	NPK	Converted treatments means
1964	23.2	26.4	26.7	26.2	26.4	25.8
O 1959	16.6	19.6	20.4	19.9	21.3	19.6
Increase	6.6	6.8	6.3	6.3	5.1	6.2
	24.1	26.6	27.2	26.1	27.3	26.2
P	17.4	19.6	20.9	19.3	20.9	19.6
	6.7	7.0	6.3	6.8	6.4	6.6 (+ 0.4)
	23.5	26.2	26.6	26.6	26.4	25.8
NP	15.8	19.9	20.4	19.4	21.0	19.3
	7.7	6.3	6.2	7.2	5.0	6.5 (+ 0.3)
	22.6	26.3	26.8	26.2	27.0	25.8
PK	16.3	19.2	19.6	20.9	20.1	19.0
	6.3	7.1	7.2	6.2	6.9	6.7 (+ 0.5)
	22.2	26.5	27.3	26.1	28.4	26.1
NPK	13.7	20.6	20.6	19.5	20.9	19.0
	8.5	5.9	6.7	6.6	7.5	7.0 (+ 0.8)
Original treatments means	23.1	26.4	26.9	26.2	27.1(S.D.1.23)	(S.D. + 1.4)
	16.0	19.8	20.4	19.6	20.8	—
	7.1	6.6	6.5	6.6	(S.D. 0.9)	6.3

TABLE II

YIELD IN G/T/T — 1964

ORIGINAL TREATMENTS

	O	P	NP	PK	NPK	
1964	19.7	19.5	23.6	21.6	23.6	21.6
1959 O	16.4	14.0	14.4	14.3	14.8	14.8
	3.3	5.5	9.2	7.3	8.8	6.8
	20.6	21.7	24.1	23.2	22.9	22.5
P	15.7	14.1	12.2	13.4	14.4	14.0
	4.9	7.6	11.9	9.8	8.5	8.5 (+ 1.7)
NP	18.4	26.3	28.2	23.2	23.0	23.8
	14.1	17.5	13.4	13.8	15.1	14.8
	4.3	8.8	14.8	9.4	7.9	9.0 (+ 2.2)
PK	20.6	21.1	24.5	22.6	22.5	22.3
	16.5	16.8	16.1	13.5	14.8	15.5
	4.1	4.3	8.4	9.1	7.7	6.8 (0)
NPK	18.5	21.5	30.6	21.3	28.4	24.1
	14.5	15.5	12.9	13.6	14.1	14.0
	4.0	6.5	17.7	7.7	14.3	10.1 (+ 3.3)
1964	19.6	22.0 (S.D. 3.00)	26.2 (S.D. 1.22)	22.4	24.1 (S.D. 1.23)	S.D. (+ 3.9)
Means	15.4	15.5	13.8	13.7	14.6	
1959	4.2	6.5	12.4	8.7	9.6	
		(+ 2.3)	(+ 8.2)	(+ 4.5)	(+ 5.3)	Overall S.D. (1.95)

These summaries are only intended to be a provisional computation of the results. Hence it is not proposed to comment at length on these results at this stage.

The only point that may be highlighted at this stage is to indicate the importance of manuring during the immature phase. This may be best done by extracting the yield data for the unmanured and manured treatments during the immature and mature phases.

YIELD INCREASE IN GRAMMES PER TREE PER TAPPING BETWEEN 1959 AND 1964

Treatments Mature phase	Treatments — Immature phase			
	No manuring (O)		Manuring with NPK Mixture (NPK)	
	O	3.3	8.8	+ 5.5
	NPK	4.0	14.3	+10.0
	+ 0.7		+ 5.5	

Manuring with NPK mixture during the immature phase and no manuring during the mature phase has given a yield increase of 5.5 g/t/t in the sixth year of tapping over no manuring during both phases; while manuring during mature phase only without any manuring during the immature phase has given a yield increase of only 0.7 g/t/t. On the other hand manuring during the mature phase, with manuring during the immature phase has given a further yield increase of 5.5 g/t/t thus giving a yield response of 10 g/t/t as a result of manuring during both phases. This gives the indication that whereas, trees manured during the immature phase respond to continued manuring during the mature phase.

Trees unmanured during the immature phase respond very little to manuring during the mature phase. There is however some evidence that the response in this instance is shown better in girthing, but here again it is only an increase 1.9 inches per tree as against an increase of 2.4 inches per tree in the case of trees manured during both phases.

The total response to manuring during both phases as against manuring only during the mature phase thus works out to an increase of 9.3 g/t/t in yield and an increase of 0.5" in girth per tree. This is the average figure for four clonal materials (*viz.* AVROS 255, PB 86 crown budded with LCB 870, PB 86 and LCB 870) obtained in a new planting in the sixth year of tapping. This response is roughly equivalent to about 430 lb dry rubber per acre per year.

Experiment 2

Effect of different levels of potassium on growth

1958 replanting—Eladuwa Estate

Summary of girths at 4 ft recorded in November 1965 on the treatment and clone basis is reported in Table III.

TABLE III
GIRTH IN INCHES IN NOVEMBER 1965

Block No.	Clone	Treatment				Mean girth
		R. 4 : 6 : 2	R. 4 : 6 : 3	R. 4 : 6 : 5	R. 4 : 6 : 8	
1	PB 86	18.0	19.0	18.6	19.1	18.7
2	GT 1	20.4	20.4	20.5	20.8	20.5
3	RRIC 28	19.4	19.1	21.1	20.6	20.0
4	RRIC 45	19.7	20.8	19.3	20.2	20.0
5	IRCI 2	18.6	20.3	19.9	19.1	19.5
6	RRIM 605	19.9	18.9	20.1	18.6	19.4
Mean girth	—	19.3	19.8	19.9	19.7	—

Experiment 3

Growth response of *Tjir-1* clonal seedlings to two levels each of N P & K/Mg 1958 replanting - Kumarawatte Group, Moneragala

DIFFERENCES IN TOTAL GIRTH BETWEEN TREATMENTS IN INCHES

	N ₂ over N ₁	P ₂ over P ₁	K ₂ over K ₁
Jan. 1962	+ 11.75 (5% ± 18.9)	- 7.17 (5% ± 19.6)	- 1.94 (5% ± 18.9)
Jan. 1963	+ 23.1 (5% ± 25.9)	- 14.24 (5% ± 25.9)	- 4.17 (5% ± 25.9)
Jan. 1964	+ 12.1 (5% ± 31.7)	- 4.60 (5% ± 31.6)	- 13.12 (5% ± 31.5)
Jan. 1965	+ 18.8 (5% ± 34.1)	- 2.3 (5% ± 34.1)	- 24.2 (5% ± 33.9)

It will be noted that differences in girth between treatment means have not reached significant levels at any stage. However, there have been certain useful indications.

Application of nitrogen at double the present recommended level is the only treatment that has shown a positive response systematically. In 1963, this almost reached the level of being statistically significant. On the other hand application of both P and K at double the present recommended levels have invariably not shown any favourable response to growth.

The differences in girth between treatment means were not statistically significant. Nevertheless it would be interesting to study the yield responses before arriving at any firm conclusions.

The mean girth of trees in an adjacent block of PB 86, which had been fertilized according to the practice prevailing on the estate and where Gautemala grass was grown in the inter-row area and its loppings used for thatching the clean-weeded strips along the rows, was recorded to be 19.8 inches as against a mean girth of 18.7 for PB 86 in the experiment.

Experiments 4, 5, 12 & 13

Growth response of *Hevea* to three levels each of N, P, K, Mg and three types of cultivation practices

There were four trials in progress in this series — two on a commercial area replanted in 1959 and two on an area in the Institute's Sub-station at Kuruwita replanted in 1961.

Points worth reporting on the basis of girth measurements recorded in 1965 are as follows:—

(1) There was a significant quadratic response to application of different levels of K and a negative linear trend to application of different levels of Mg in one of the experiments.

TOTAL GIRTHS OF TREES IN INCHES RECEIVING DIFFERENT LEVELS
OF K & Mg

K/Mg	0	1	2	Totals
0	121.9	124.1	121.7	367.7
1	127.8	123.7	125.1	376.6
2	122.4	122.5	120.8	365.7
Totals	372.1	370.3	367.6	

The interaction between K levels and cultivation treatments was also significant in the same experiment.

(2). The effect of cultivation treatments and the interactions of cultivation treatments with levels of N and with levels of P and the interaction between levels of N with levels of P showed significance in one of the other trials.

Experiment 15

Trials with different fertilizer materials

A trial being conducted to compare the effects of three brands of complete concentrated fertilizers with standard inorganic fertilizer mixtures on the growth of rubber plants during the immature phase has shown that all three brands of complete concentrated fertilizers are significantly better than the standard NPK mixture.

The beneficial response was of the order of 1 inch of girth per tree. There were no differences between the three brands of complete concentrated fertilizers.

Experiment 17

Trial on time of fertilizer application to mature rubber

No significant differences in yield have so far been noticed as a result of applying fertilizers at different times of the wintering cycle. However there has been some evidence to indicate that application of fertilizers after wintering and before refoliation is complete and split application of K and P before wintering in conjunction with application of N after refoliation may lead to a beneficial effect on yield compared with fertilizer application before wintering or after refoliation.

Experiment 20

Trials with different levels of N, P, K, and Mg on clonal rubber that had not been manured for a long period (10 years or more) — Pannila Group

A 15-acre block of PB-86, comprising eight tapping blocks with a history of not having been manured for more than ten years from a middle-class holding in the Kalutara District was made use of for this investigation.

The following experiments are in progress to study the effects of two, three or four levels each of the nutrients N, P, K, and Mg on the growth and yield of *Hevea* material described above.

- (a) Effect of 2 levels each of the four nutrients 2^4 N×P×K×Mg experiment. Plot size 4 trees. (Tapping blocks 2 and 6)
- (b) Effect of 3 levels each of three nutrients, N, P, & K with basic application of Mg 3^3 N×P×K experiment. Plot size 2 trees. 2 replications. (Tapping blocks 1 and 5)
- (c) Effect of four levels each of 2 nutrients at a time, with basic application of the other two.

- | | | | |
|-------|-------|--------|-------------------------------|
| (i) | 4 × 4 | N × P | (basic application of K & Mg) |
| (ii) | 4 × 4 | K × Mg | (—do— of N & P) |
| (iii) | 4 × 4 | P × K | (—do— of N & Mg) |
| (iv) | 4 × 4 | N × K | (—do— of P & Mg) |

Effective plot size 4 trees (Tapping blocks 3, 4, 7 and 8)

Experiments commenced with the preliminary recording of girth in December 1963. Fertilizer applications according to experimental layouts were given in March/April 1965 after recording preliminary yields for a period of one year during 1964.

Yields have now been recorded for a period of 12 months following fertilizer applications. Girth measurements have also been recorded in March 1965 and March 1966.

The data, thus far obtained are being processed now.

CULTIVATION PRACTICES, GROUND COVERS AND WEED CONTROL

Planting systems

Arising from an investigation into the possibilities of reducing error variance to the minimum in experimental areas, a careful study was made of the different systems of planting in vogue. It was realised that the only drawback of planting on dead level contour, namely that it gave rise to unequal distribution of growing space per plant could be overcome by adopting a system of staggering the distances between planting points along the contour to balance the variation in distances between contours which was inevitable depending on the terrain of the land surface.

This system seemed to offer a practical way of providing equal space for every plant without having to compromise on the advantages of dead level contour planting.

A small area that was due for replanting at Dartonfield was planted on this system by way of an exploratory demonstration trial.

This served the useful purpose in that it provided an opportunity of appreciating some of the finer points in the procedure that must be followed if an area is to be planted on this system.

As a result of the experience gained by this trial planting, it is now believed that rows traced with an average distance of 22' (range 14' — 30') would be best suited for land surfaces with moderate to steep slopes.

The average distance of planting along the contour rows would then vary between 11' (range 8' to 16'); 12' (range 9' to 18') and 13' (range 10' to 19') for planting densities of 180, 165 and 150 respectively. Planting distances would vary anything between 8' x 30' and 14' x 14' for densities of planting between 180 and 150.

It was found that it would be better to commence lining operations from the bottom of the slope at all times, starting from one side of the leader drain along the steepest section of the land.

Ground covers

Ground cover policies have been subject to re-appraisal in the context of stringent economies having to be exercised in operational costs.

A simple experiment is in progress at the Institute's Sub-station at Kuruwita to observe differences in growth under two systems of ground cover policies in an area replanted in 1963.

The two systems under trial are :

- (1) Establishing and maintaining a pure stand of *Pueraria phaseoloides*.
- (2) Natural ground covers kept under control by spraying herbicides as and when necessary.

Trials of this nature should be carried out in relation to costs.

Weed control

Work on weed control has been confined to testing some of the newer herbicides namely C-243, Daelhal, Surcoper, and Afalm that became available in 1965.

Trial sprayings have been carried out with these herbicides at various concentrations and combinations. These experiments are in progress and observations have been made from time to time.

INDEX TO FIELD EXPERIMENTS

1. Trial of nitrogen and potassium in the presence of phosphorus on four clonal materials — 1952 clearing — Hedigalla
2. Effect of four levels of potassium in the presence of N & P (six clones) — 1958 replanting — Eladuwa Estate
3. 2³ NPK Trial — Tjir 1 clonal seedlings. Area considered marginal for rubber — 1958 replanting — Kumarawatte Group
4. 3³ N x P x cultivation treatments trial in the presence of K & Mg on clone PB 86 — 1959 replanting — Parambe Group — Kegalle District
5. 3³ K x Mg x cultivation treatments trial in the presence of N & P on clone PB 86 — 1959 replanting — Parambe Group — Kegalle District

Trials on fertilizer application according to physiological diagnosis

6. Galle District—clone PB 86—immature/mature phase—1959 replanting—Nakiadeniya Group
 7. Kalutara District—clone PB 86—immature phase—1960 replanting—Gallewatte Estate
 8. Kegalle District—clone G1 1—mature phase—1951 replanting—Parambe Group
 9. Kalutara District—clone PB 86—mature phase—1949 replanting—Eladuwa Estate
 10. Kelani Valley District—clone PB 86—mature phase—1949 replanting—Salawa Estate
 11. 2³ NPK trial in the presence of Mg from two sources on clone PB 86—1961 replanting—RRIC Sub-station Kuruwita
 12. 3³ N×P×cultivation treatments trial in the presence of K & Mg on clone PB 86—1961 replanting—RRIC Sub-station—Kuruwita
 13. 3³ K×Mg×cultivation treatments trial in the presence of K & Mg on clone PB 86—1961 replanting—RRIC Sub-station—Kuruwita
- (N.B.— Same as experiments 5 & 6; but with the difference that loppings of Guatemala grass used for one of the cultivation treatments obtained from within and from outside the experimental plots).
14. Growth response to the three major nutrients N, P & K each from three different fertilizer materials—1961 replanting—Gallewatte Estate
 15. Growth response to three brands of complete concentrated fertilizers—1961 replanting—Gallewatte Estate
 16. Trial with different levels of N, P & K on clone susceptible to wind damage *viz.* clone LCB 1320—1959 replanting—Mirishena Estate
 17. Time of fertilizer application trial—mature phase—clone PB 86—1951 replanting—Dewalakande Estate
 18. Effect of 8 levels of standard fertilizer mixture R. 4 : 6 : 3 + Mg on 8 clones—1963 replanting RRIC Sub-station—Kuruwita
 19. Trial on leguminous ground covers vs. Natural ground cover kept under control by herbicide spraying—1963 replanting—RRIC Sub-station—Kuruwita
 20. Trials with different levels of N, P, K and Mg on clonal rubber that had not been manured for a long period (ten years or more).

RUBBER CHEMISTRY DIVISION

By

M. NADARAJAH

Advisory service

Estates were given advice on smoke house operation, drying tower operation, sole crepe manufacture, crepe and sheet manufacture, weighing of latex, pre-coagulation etc. It was found that where calcium causes pre-coagulation and this has been observed in estates in the Matale District which has limestone in the soil, the use of washing soda (sodium carbonate) as an anticoagulant in the field and in the transportation tank was very effective in minimising pre-coagulation.

Despatch of latex

Samples of latex of clones RRIM 501 and Nab 12 collected in vessels surrounded by ice have been sent monthly in polythene containers packed in ice in a Thermosflask, to the laboratories of the Natural Rubber Producers' Research Association at Welwyn Garden City, England, for research purposes.

L.I.R.I. course

Assistance was given to the I.R.I. (Ceylon Section) by Messrs. M. Nadarajah and O. M. R. Sirisena to conduct classes leading up to the L.I.R.I.

Rubber seed oil

Field experiments were carried out at St. Fergus Estate, Polgahawela to ascertain the cost of collection of rubber seed. The cost was found to vary from 4 cts. to 10 cts. per 100 seeds. The factors that affect cost of collection are :—

1. Rate of seed-fall per day
2. Weather conditions
3. Topography of the Estate (flat or hilly land)
4. Presence or absence of cover crops

Samples of oil expelled from seeds were subjected to various treatments at the C.I.S.I.R. and were analysed to determine their physical and chemical characteristics. The prospects of the suitability of the oil being used as a drying oil is not quite promising but it may serve well in the manufacture of liquid soap.

Technical specifications

Samples of Estate Brown Crepe and Pale Crepe from estates and brokers were analysed for :—

- (a) Dirt content
- (b) Plasticity Retention Index
- (c) Nitrogen content
- (d) Copper content

- (e) Manganese content
- (f) Ash content
- (g) Volatile matter content

and classified with a view to selling to a technical specification.

Our analyses have shown that nearly all No. 1 and No. 2 pale crepe manufactured in Ceylon conforms to 1st grade specification except a few which fall outside, due to dirt contents. Pale crepe No. 3 sometimes tends to fall outside specifications due to high volatile matter contents. In the case of Estate Brown Crepe too, care must be taken to ensure that dirt and volatile matter contents are kept within specification limits. As a result of convincing planters of the value of technical specifications, several estates now sort their white cup lump and convert it into cup lump crepe, and sell it as such. This rubber fetches a premium in the Estate Brown Crepe grade.

Plasticity Retention Index (PRI)

Plasticity Retention Index is the resistance of raw rubber to oxidative degradation by ageing. The Natural Rubber Producers' Research Association, England have devised a method for determining this resistance. It consists in measuring the change in plasticity when raw rubber is heated for 30 minutes at 140° C, the Plasticity Retention Index being expressed as the percentage of aged to original plasticity.

Since Plasticity Retention Index is an important specification, as regards quality of natural rubber, experiments were initiated to investigate the factors which affect it. A Hoekstra Plastimeter was used for these investigations. It was found that the PRI could vary with the clone from which the latex is obtained. The results obtained for clones Nab 12, Nab 15, RRIM 501 and PB 86 are given in Table I.

TABLE I

PRI OF SAMPLES FROM 4 CLONES (MEAN OF 3 DETERMINATIONS)

Sample	Clone			
	Nab 12	Nab 15	RRIM 501	PB 86
Total solids	131.9	100.6	138.1	132.6
Cup lump	54.8	63.8	83.1	36.0
Panel scrap	42.4	37.7	72.4	24.3

It will be seen that the PRI of panel scrap and cup lump have a much lower value than that of the corresponding total solids. An explanation for this could be that they have been exposed to sunlight and to atmospheric conditions for about 2 days. The results obtained by exposing total solids film for 6 hours to direct sunlight is given in Table II.

TABLE II

PRI OF SAMPLES FROM 4 CLONES (MEAN OF 3 DETERMINATIONS)
AFTER EXPOSURE TO DIRECT SUNLIGHT FOR 6 HOURS

Sample	Clone			
	Nab 12	Nab 15	RRIM 501	PB 86
Total solids before sun ageing	131.9	100.6	138.1	132.6
Total solids after sun ageing for 6 hours	61.9	61.4	77.6	57.8

Another explanation is that there is an increase in calcium content towards the end of latex flow and during spontaneous coagulation, the phosphatides in latex get degraded by the enzyme phospholipase D activated by calcium ions. The values of PRI obtained after collecting latex from ten trees at 15-minute intervals and converting it into total solids and into crepe by formic acid coagulation from trees of clone RRIM 501 and PB 86 are given in Table III.

TABLE III

VARIATION OF PRI AND YIELD OF LATEX COLLECTED AT 15-MINUTE INTERVALS AFTER TAPPING

Time	Latex converted to total solids				Latex converted to crepe after acid coagulation						Latex converted to crepe after spontaneous coagulation					
	Clone PB 86		Clone RRIM 501		Clone PB 86			Clone RRIM 501			Clone PB 86			Clone RRIM 501		
	PRI %	Weight grms.	PRI %	Weight grms.	PRI %	Ca ppm	Weight grms.	PRI %	Ca ppm	Weight grms.	PRI %	Ca ppm	Weight grms.	PRI %	Ca ppm	Weight grms.
1st 15 minutes	101.9	153.4	113.3	55.7	69.6	23	135.2	77.6	31.5	53.2	95.6	29	110.5	94.5	42	40.6
2nd 15 minutes	106.3	83.9	113.8	34.6	74.0	19.5	75.1	65.6	25	23.4	95.4	20	53.2	76.0	14	19.3
3rd 15 minutes	106.6	39.6	113.3	21.6	73.9	14.5	31.6	71.1	22	12.2	94.1	21	24.8	70.0	21	9.2
4th 15 minutes	110.8	14.7	116.1	14.3	54.8	25	8.4	42.5	23	7.3	82.4	19	7.2	74.1	41	5.1
5th 15 minutes	115.0	4.7	108.8	7.1	47.4	44	3.0	34.6	21.8	3.5	90.6	27	2.8	52.3	110	2.8
6th 15 minutes	118.2	1.9	111.1	4.9	17.8	160.5	1.1	21.7	47.5	2.4	87.7	218.8	1.2	48.2	176	2.2
7th 15 minutes	—	—	116.0	3.1	—	—	—	18.5	81.8	1.5	—	—	—	25.0	—	2.3
8th 15 minutes	—	—	—	—	—	—	—	14.3	116.7	1.8	—	—	—	29.0	—	1.2
9th 15 minutes	—	—	—	—	—	—	—	10.5	168.8	0.8	—	—	—	—	—	—
Panel scrap	61.8	10.2	84.4	13.3	22.6	771.5	7.0	63.8	123.5	4.9	48.9	500	11.0	72.1	760	7.6

It will be seen that whilst the total solids show no drop in PRI with latex flow there is a drop in PRI of crepe prepared from latex towards the end of latex flow. Further, this drop in PRI was noticed when latex was collected at 15-minute intervals, and allowed to coagulate spontaneously and the PRI determined on them. This shows that the enzymatic degradation of phosphatides occurs only during acid coagulation.

The adverse influence of calcium on PRI was confirmed by soaking cup lump in 0.1% calcium acetate for 24 hours and determining the PRI (Table IV).

TABLE IV
EFFECT OF SOAKING IN CALCIUM ACETATE ON PRI

Treatment	Clone	
	PB 86	RRIM 501
Cup lump (without soaking)	51.3	88.2
Cup lump after soaking in water for 24 hours	47.3	75.9
Cup lump after soaking in 0.1% calcium acetate for 24 hours	45.3	73.5

PRI can be maintained by preventing the enzymatic oxidation. This can be brought about by removing the calcium ions before acid coagulation. EDTA inhibits this enzymatic action by forming complex ions with calcium.

Thiol groups also catalyse the oxidation of phospholipids. The effect of thiol groups on PRI is given in Table V.

TABLE V
EFFECT OF THIOL GROUP (CYSTEINE HYDROCHLORIDE) ON PRI

		Total Solids		Latex Crepe	
		PB 86	RRIM 501	PB 86	RRIM 501
		Cysteine	0%	94.8	128.5	82.2	86.1
Cysteine	0.03%	93.6	125.7	79.7	86.1
Cysteine	0.15%	93.6	125.7	73.4	80.5
Cysteine	0.30%	92.1	124.2	70.8	77.7

The oxidation of phospholipids catalysed by thiol group could be inhibited by several types of compounds which react with thiol groups for example, mercurials form undissociated mercuric sulphides. The effect of the thiol inhibitor namely Antimucin (phenyl mercuric acetate) on PRI is given in Table VI.

TABLE VI
EFFECT OF ANTIMUCIN ON PRI

	Total Solids		Latex Crepe	
	PB 86	RRIM 501	PB 86	RRIM 501
Antimucin 0%	90.9	128.5	77.2	91.6
Antimucin 0.04%	90.6	134.2	77.2	91.6
Antimucin 0.06%	94.2	122.2	79.7	91.6
Antimucin 0.12%	95.9	119.4	81.0	94.4
Antimucin 0.25%	95.7	117.1	81.0	94.4
Antimucin 0.48%	94.5	117.1	76.3	91.8

It will be seen that very low concentrations of Antimucin inhibit the oxidation. However higher concentrations of Antimucin lower the PRI as mercury is a pro-oxidant.

Oxalic acid is the best coagulant to give a high PRI in crepe manufacture. This may be due to its complexing and hence inactivating the calcium present in latex. The use of RPA 3 causes a lowering in PRI. This is expected as RPA 3 is a peptising agent. Further the thiol group in RPA 3 catalyses the enzymatic degradation of the phospholipids in rubber causing a lowering in PRI. Sodium bisulphite which is used to prevent the enzymatic discolouration of rubber acts as an antioxidant and a cross-linking agent thus increasing the PRI. The results obtained on the influence of these rubber chemicals is given in Table VII.

TABLE VII
INFLUENCE ON RUBBER CHEMICALS ON PRI

	Clone	
	PB 86	RRIM 501
(1) <i>Effect of coagulant</i>		
(a) Oxalic acid	96.8	119.2
(b) Formic acid	90.9	102.5
(c) Acetic acid	89.0	101.3
(2) <i>Effect of RPA 3</i>		
(a) Without RPA 3	87.8	106.3
(b) With RPA 3 (0.05%)	71.8	91.0
(3) <i>Effect of Sodium bisulphite</i>		
(a) Sodium bisulphite 0% on T.S.	114.3	131.6
(b) Sodium bisulphite 0.5% on T.S.	115.9	142.1
(c) Sodium bisulphite 1.5% on T.S.	120.9	147.4
(d) Sodium bisulphite 3.0% on T.S.	129.8	166.1

Cup lump should not be soaked in water for long periods as there is the possibility of the antioxidants getting leached out. The quality of the scrap could be improved by soaking in EDTA or in oxalic acid.

Metals like copper manganese and iron are catalysts of ageing and lower the PRI. It was found that the latex of clone PB 86 is more prone to oxidation than the latex of clone RRIM 501.

The effect of copper, manganese and iron on PRI is given in Table VIII. Copper was added as cupric sulphate, manganese as manganous sulphate and iron as ferrous sulphate.

TABLE VIII
EFFECT OF COPPER, MANGANESE AND IRON ON PRI

Metal added	Concentration in ppm	PRI	
		Clone PB 86	Clone RRIM 501
No metals added	0	118.0	131.8
Copper	4	117.5	131.8
Copper	8	108.3	127.8
Manganese	10	116.0	131.8
Manganese	15	116.0	131.8
Manganese	25	112.6	129.6
Iron	40	116.7	131.8
Iron	1000	110.0	129.8
No metals added		114.1	130.6
Copper + Manganese	Cu (4) + Mn (10)	113.1	130.6
Copper + Manganese	Cu (4) + Mn (15)	113.1	130.4
Copper + Iron	Cu (4) + Fe (40)	113.0	130.4
Manganese + Iron	Mn (10) + Fe (40)	113.0	130.6
Manganese + Iron	Mn (15) + Fe (40)	113.0	130.6
Copper + Manganese + Iron	Cu (4) + Mn (10) + Fe (40)	112.2	130.4
Copper + Manganese + Iron	Cu (4) + Mn (15) + Fe (40)	112.2	130.4
Copper + Manganese	Cu (8) + Mn (25)	112.4	128.4
Copper + Iron	Cu (8) + Fe (1000)	111.8	128.7
Manganese + Iron	Mn (25) + Fe (1000)	112.4	128.3
Copper + Manganese + Iron	Cu (8) + Mn (25) + Fe (1000)	109.6	126.4

It will be seen from the results that the activity of these metals as catalysts of ageing can be compared approximately as follows:—

$$\begin{aligned} 25 \text{ ppm Mn} &= 4.5 \text{ ppm Cu} \\ 1000 \text{ ppm Fe} &= 6.5 \text{ ppm Cu} \end{aligned}$$

Concentrated latex

Regular testing was carried out and advice given to an estate manufacturing concentrated latex so as to ensure that their latex was up to specification. The estate has the following clones:—

PB 86	...	98	acres
Tjir 1	...	90	"
Tjir 1 seedling	...	50	"
Glen 1	...	89	"
Mil 3/2	...	37	"
Pil B 84	...	32	"

On the basis of previous analyses, the dosage of a 13.5% solution of Diammonium hydrogen phosphate in pints recommended per hundred gallons field latex, so that the magnesium content is brought below 50 ppm on the concentrated latex is as follows :—

January and February	...	12	pints
March and April	...	9	"
May and June	...	10	"
July, August and September	...	12	"
October, November and December	...	10	"

S. P. Sole Crepe

Preliminary experiments were done on the preparation of vulcanized sole crepe based on the following systems :—

- (1) Sulphurless curing system containing Tetramethyl thiuram disulphide activated by Thio-urea.
- (2) Peroxide vulcanization.

Technical service

Inquiries regarding technical services were answered and demonstrations were given on :—

- (1) Rubberising fibre
- (2) Latex dipping
- (3) Latex casting

SMALLHOLDINGS DEPARTMENT

By

H. H. PEIRIS

INTRODUCTION

The work of the Smallholdings Department both in the field and office increased during the year under review. Fairly large numbers of subsidy replanting and new planting permits were again issued and the consolidation of the old sulphur dusting groups, organisation of new groups and supervision of all the groups were again undertaken. The Publicity Unit functioned in the field throughout the year. Assistance to smallholders was given in the form of advisory visits, tracer lining for planting holes and soil conservation works and the usual free advisory services continued to be given to rubber smallholders in general.

GENERAL

Visitors

Two Advisory Officers of the Rubber Research Institute of Malaya were sent here to see our work in rubber smallholdings and study methods adopted. From 20th to 29th October they visited smallholdings in almost all rubber-growing areas of the Island, the Research Institute at Agalawatta and watched the grading of rubber sheet at the Central Depot of the Commissioner for Commodity Purchase at Mattakkuliya. They also visited other places of interest.

Exhibitions

The most important exhibition in which this department participated during the year was the "Ceylon Government Industrial Exhibition" which was opened by the Governor-General on 1st February. This department shared a very attractive stall with the other departments of the Institute. Our exhibits were a new soil conservation and planting model, smoke house models of 80 sheet and 1,500 lb capacities, a rubber curing shed model, posters showing deficiency diseases in rubber leaves, photographs of *Fomes*-affected roots, a seed display box and samples of smoked sheets.

In addition to the above, the department participated in the exhibitions noted below :

1. Mihindu Maha Vidyalaya, Agalawatta — 14th — 16th March
2. Yakella and Getiyamulla Maha Vidyalaya, Undugoda — 25th — 26th June
3. Balika Vidyalaya, Kotte — 17th August
4. Dharmapala Vidyalaya, Pannipitiya — 17th — 19th Sept.
5. Rural Development Society, Higgoda — 25th — 26th Sept.
6. Mayurapada Maha Vidyalaya, Mawanella — 13th November
7. Government Training College, Mirigama — 27th Nov. — 3rd Dec.

Advice was given and exhibits were lent to Museaus Collège, Colombo to participate in the Educational Exhibition held at Royal College on 25th September. 1965. The Publicity Unit participated in 6 of the above-mentioned exhibitions.

Loans

Five loans totalling Rs. 21,850/- for purchase of cars, a motor cycle, a push cycle and for repairs to a motor cycle were given to the Chief Advisory Officer, one Divisional Advisory Officer, two Rubber Instructors and one Replanting Attendant.

Correspondence

The following figures in regard to correspondence are an indication of the volume of work done during the year both in the field and the headquarters of this department.

General :

Inward 7,264

Outward 11,538

With the Rubber Controller :

Inward 2,075 (from the Rubber Controller with new planting applications etc.)

Outward 3,834 (*i.e.* 1,207 preliminary reports, 1122 final inspection reports and 1,505 special reports).

From the field officers to permit-holders :

3,408 (not included in the above figures)

Publications

The Sinhalese version of the new leaflet No. S. H. 10 on the "Manufacture of Smoked Rubber Sheet" has been prepared and it is with the printer. Several leaflets were reprinted.

The Annual Review of the department was published in Sinhala and distributed among smallholders in order to acquaint them with the work done by this Department.

ASSISTANCE TO SMALLHOLDERS

The field officers assisted the smallholders in lining their permit areas and advised them on all aspects of rubber agriculture (such as planting, disease control methods, manuring, tapping, sheet-making and smoking etc.)

925 aluminium coagulating pans were issued to smallholders at concession rates.

4 tons of R. 4 : 6 : 5 fertilizer mixture were bought for a small estate owner at a discount of 5%.

For the purpose of producing better quality smoked rubber sheet by smallholders, construction of 54 demonstration smoke houses and 72 ordinary smoke houses was commenced of which 42 demonstration smoke houses and 44 ordinary smoke houses were completed during the year. A grant of Rs. 75/- was paid to every demonstration smoke house that was satisfactorily completed.

ANNUAL FIELD DAY

The Annual Field Day of the department was held at the Mayurapada Maha Vidyalaya, Mawanella on 13th November, 1965. The Community Development Centre had arranged an exhibition in the same school on this day and the Smallholdings Department also participated. All field officers of this department except three Rubber Instructors (who were on sick leave) attended.

The Chief Advisory Officer Smallholdings opened the day's proceedings by welcoming the guest speakers and thanking them for the trouble taken in coming there.

Messrs. M. T. Veerabangsa and D. S. Muthukuda delivered very useful lectures with demonstrations on the Prevention of Precoagulation of Latex and Manufacture of Sheet Rubber.

After the tea break the C.A.O.S. in welcoming the Acting Director, R.R.I.C., Dr. Ronald T. Wijewantha said that he was no stranger to the department as he was the Head of the Smallholdings Department five years ago and having proceeded abroad on a scholarship for his Ph.D. he returned as the Head of the Botany Division and now he has been appointed to the high and important position of Director of the Rubber Research Institute of Ceylon. He wished him success.

The Director while thanking C.A.O.S. for inviting him announced the details of the reorganisation of the smallholdings Department. He stated that the Ministry of Commerce and Trade has requested the Institute to improve the quality of smallholders' rubber as China has agreed to pay -/05 cts. more for every pound of No. 1 smoked sheet supplied to them provided the percentage of this grade is not less than 50% of the total quantity of rubber sheet supplied. He stated that at present the percentage of smallholders' Grade I sheet was very low and the officers were advised to accept this challenge and to make every possible effort to get the smallholders to step up the production of Grade I sheet so that the country would benefit by about 6 million rupees foreign exchange which is a vital need now.

Mr. M. Nadarajah, Head of the Rubber Chemistry Division in his address on sheet manufacture stated that the estates produce 94% Grade I sheet while the smallholders produce only 20%. He made very valuable suggestions for the improvement of smallholders' sheet.

After assembly of the successful tapping class trainees and other smallholders the C.A.O.S. explained the importance of improving sheet and the reasons why the training classes were held. Subsequently the Acting Director, R.R.I.C. distributed the certificates to the trainees.

The Divisional Advisory Officer (Kegalle) after explaining the Group Scheme on Rural Development Work at Mawanella, invited the Acting Director, R.R.I.C. to open the exhibition.

REPLANTING

Considerable attention was paid by the field staff in assisting smallholders as well as small estate owners (on request) in replanting their permit areas according to the requirements of the Rubber Replanting Subsidy Scheme.

The following Rubber Replanting Subsidy Scheme permits issued for smallholdings during the year were in force as at 31st December, 1965 :—

<i>Number of Permits</i>	<i>Acres</i>	<i>Roods</i>	<i>Perches</i>
3,728	4,829	0	34

Copies of the permits issued by the Rubber Controller to smallholders and received by this department from time to time were forwarded to the Range Instructors.

Every one of the above 3728 smallholdings was visited by a Rubber Instructor. 6718 visits were made to 1965 replanting permit areas during the year. 30,111 visits were made during the year to replanting and replanted smallholdings of the previous years.

During the year Instructors lined 1414 permit areas totalling 1816 acres 0 roods 23 perches for soil conservation works and 1804 permit areas of 2398 acres 1 rood 19 perches for planting holes in the 1965 permit areas. Similarly, Rubber Instructors have lined a further 540 permit areas of 669 acres 2 roods 21 perches in extent for soil conservation works and 578 permit areas of 920 acres 2 roods 15 perches in extent for planting holes in permit areas of the previous year.

170 special reports on subsidy replanting permit areas were submitted to the Rubber Controller.

24,819 tappable trees in 436 subsidy replanted smallholdings have been marked by Rubber Instructors by way of demonstrations.

A total of 212 visits were made by field staff to Commodity Purchase Depots for inspection of smallholders' sheet rubber and advising them on how to avoid defects seen in their sheet. 113 visits were made to the Depots by the field staff for the purpose of random checking of planting material issued to subsidy replanting smallholders. In all 14,366 plants were examined at these visits.

NEW PLANTING

Apart from replanting work Rubber Instructors devoted part of their time in visiting, advising and assisting rubber new planting smallholders. Each new smallholding for which rubber new planting rights were desired was visited and reported on by a Rubber Instructor before a permit was issued by the Rubber Controller. 1,207 such preliminary inspections were made and reports sent to the Rubber Controller during the year. 949 new planting permits covering 1,406 acres 2 roods 0 perches in extent were issued during the year.

2,113 visits were made by the field staff to new planting and new planted permit areas of the years 1965 and 1964 for advice and lining assistance. A new record sheet (yellow form) was entered up for each of the year's new planting permit areas visited. The condition in which the previous year's new-planted areas was found and the work recommended to be done were recorded in the relevant form for each such permit area visited in 1965.

1,122 final inspection reports and 1,505 special reports were made by Rubber Instructors during the year. Further, a total of 10,299 subsequent visits were made by the field staff to new-planted permit areas of previous years.

Rubber Instructors lined 230 permit areas of 307 acres 3 roods 28 perches in extent for soil conservation works and 266 permit areas of 413 acres 3 roods 35 perches in extent for planting holes in this year's (1965) permit areas.

Similarly, 124 permit areas of 184 acres 1 rood 18 perches in extent were lined by Rubber Instructors for soil conservation works and also 128 permit areas of 178 acres 2 roods 22 perches in extent for planting holes in last year's (1964) new planting permit areas. Divisional Advisory Officers have checked such lining in the field in 107 new planting permit areas.

Rubber Instructors marked 4,873 tappable trees in 97 new-planted small-holdings.

Soil conservation

Rs. 4,997.88 were paid as soil conservation grants to 98 peasant class permit-holders during the year. 108 holdings were measured by Rubber Instructors, vouchers prepared and submitted. Divisional Advisory Officers random checked the measurement reports submitted in 88 cases.

SPECIAL INSPECTIONS FOR THE RUBBER CONTROL DEPARTMENT

The following inspections were undertaken at the request of the Rubber Controller in addition to the normal advisory visits mentioned in this report.

Visits for preliminary reports	...	...	1,207
Visits for final inspection reports	...	...	1,122
Visits for special reports (new planting)	...	...	1,505
Visits for special reports (subsidy replanting)	...	...	170
Visits for random checking of planting material	...	...	113

SULPHUR DUSTING

The State-aided Sulphur Dusting Scheme organised by the department was only partly carried out during the wintering season in January to March, 1965. because part (140 tons) of our consignment of sulphur (240 tons) had been unloaded in Cochin harbour and after being transhipped from there arrived in Ceylon too late for our use. When refoliation had already started in many areas the balance sulphur was not available for dusting. Sulphur dusting had therefore to be abandoned in about half the number of dusting groups.

Before the commencement of dusting the correct procedure of dusting and other requisite instructions such as proper maintenance of dusting machines, supervision of dusting, submitting daily, weekly and monthly reports on the progress and results of dusting and the checking of accounts of incidental expenses of different co-operative dusting groups were given to the staff. The necessary forms for these purposes were distributed among the staff well in time.

Collection of money for incidental expenses in the co-operative dusting scheme was one of the greatest difficulties which had to be overcome. As was done earlier only Rs. 5/- per acre was collected from the group members for incidental expenses. In many cases the Rubber Instructors and the Supervisory Staff had to personally see to the collection of money.

The departmental mechanic and the agents of the sulphur dusting machines did the servicing of dusting machines, prior to the commencement of dusting. Each accepted co-operative dusting group was issued a sulphur dusting machine on loan. Spare machines were made available at central spots in order to avoid interruptions at dusting. Discussions at the monthly conferences held in the six divisions from July to September helped to solve the difficulties faced during the period of group formation.

Out of 100 co-operative dusting groups formed for dusting in 1964 only 54 groups were dusted during the last 1964 season due to non-availability of sulphur dust. Hence there were 46 dusting groups formed during the 1964 dusting season which had to participate in the 1965 season. Therefore only 54 new groups were formed to bring the number of groups to 100 as in the previous year. By the end of September 1964 applications were received and accepted for new sulphur dusting groups. As some of the group members dropped out at the last moment only 49 groups could be formed making the number of groups up to 95 in all and comprising 2892 holdings with a total acreage of 9845½ (Table I — Annexure I).

TABLE I

District	Acreage		Holdings	
	1964	1965	1964	1965
Kalutara	2962	2834½	896	814
Colombo	2550	2260	843	784
Kegalle	2365½	1939½	675	588
Ratnapura	1710	1590½	424	470
Galle	1063½	646½	208	153
Matara	197	500	40	69
Kandy	74	74	14	14
Total	10922	9845½	3100	2892

The distribution of co-operative sulphur dusting groups according to districts is given in Table II and Annexure II

TABLE II
DISTRIBUTION OF SULPHUR DUSTING GROUPS ACCORDING TO DISTRICTS

District	Distribution of Groups	
	1964	1965
Kalutara	26	26
Colombo	22	21
Kegalle	24	22
Ratnapura	15	14
Galle	10	6
Matara	2	5
Kandy	1	1
Total	100	95

As in previous year Kalutara continued to be the single district with the largest acreage accepted i.e. 2834 $\frac{3}{4}$ acres. The smallest acreage in a single district was Kandy with 74 acres.

Each group had its machine operator and two labourers to carry the machine. As almost all machine operators had previous experience in sulphur dusting there were no demonstrations and training in this season.

The Rubber Instructors were instructed to personally supervise the first two rounds of dusting in all groups. Subsequent rounds of dusting were to be supervised as duties permitted. Most of the dusted groups had four rounds of dusting.

This year the quota of dust per acre was brought down from 60 lb to 50 lb primarily because of the higher cost of sulphur.

Dusting operations commenced on 5-1-65 in Uduwa Sulphur Dusting Group in Undugoda Range, and it was the first to complete dusting having completed the final round on 16-2-65. The dusting operations for the season were concluded on 23-3-65 when the Dodampapitiya Sulphur Dusting Group in Migahatenne Range was given the final round of dusting.

It has been reported that a number of groups had to start sulphur dusting as early as 2.00 a.m. in order to complete the day's dusting programme by 8.00 a.m.

Results

This year the dusted and undusted holdings which refoliated early generally showed no signs of infection by *Oidium* due to the dry weather prevailing during refoliation. But it has been observed that the undusted holdings which were late winterers were infected with *Oidium*.

Summary

Number of holdings dusted	...	...	1,171
Acreage dusted	...	...	4,253 $\frac{1}{2}$
Number of groups which functioned	...	...	43
Average size of a holding	...	...	3.6 acres
Size of the smallest holding	...	...	$\frac{1}{4}$ acre
Size of the largest holding	...	...	24 acres
Average number of holdings in a group	...	...	27
Average cost of dusting an acre including sulphur	...	...	Rs. 11.34

Meepitiya and Polambegoda Sulphur Dusting Groups in Aranayake Range did not use the departmental sulphur dust issued for this year. Meepitiya Group used last year's sulphur and Polambegoda bought sulphur from a private source.

Although the sulphur dusting groups were formed and accepted to dust an acreage of 9845 $\frac{1}{4}$ acres, dusting was done only on 4,253 $\frac{1}{2}$ acres due to circumstances beyond our control.

The smallest holding to be dusted was $\frac{1}{4}$ acre in extent. The total acreage dusted consisted of 3389 $\frac{1}{4}$ acres of budded rubber, 779 $\frac{3}{4}$ acres of clonal seedling rubber and 84 $\frac{1}{2}$ acres of ordinary unselected seedling rubber. Of the total acreage, 3,661 $\frac{3}{4}$ acres (86%) were provided with subsidised sulphur at the rate of Rs. 6/05 per acre and 591 $\frac{3}{4}$ acres were supplied with sulphur dust at the non-subsidised rate of Rs. 12/10 per acre.

A follow-up questionnaire was distributed to ascertain the results of sulphur dusting after a period of time. Rubber Instructors were instructed to visit all dusted holdings, meet smallholders and report on these areas after six weeks from the completion of dusting.

The answers to the questionnaire reveal that :—

1. Almost all the dusted holdings were free from *Oidium*.
2. In general the incidence of the disease in *undusted holdings has been heavier than the previous year*.
3. In dusted holdings, especially in the partial and late winterers infection by *Oidium* appeared on a very small-scale.
4. Almost all the smallholders who took part in this scheme this year have expressed their willingness to participate in the scheme in the coming year as well.

Sulphur dusting for 1966

For the forthcoming 1966 sulphur dusting season a total of 103 co-operative dusting groups are expected to be organised as funds are limited and therefore no substantial increase in acreage could be made. The acreage therefore, is expected to be approximately 10,775. Approximately 240 metric tons of approved sulphur dust is expected to be used during the 1966 dusting season. The number of pounds of dust to be used will be 50 per acre for the season and the number of sulphur dusting rounds will be 4.

PUBLICITY UNIT

During the year a total of 105 publicity meetings and exhibitions were held in the ranges by Range Instructors assisted by the Rubber Instructor, Publicity Unit. Four of these meetings and exhibitions were held at points where tapping training classes were organised by the Range Instructors. This proved very useful to the trainees and other smallholders. The usual set of slides on the following subjects *viz. Oidium, Fomes*, soil conservation, tapping and tapping posters were projected and simultaneously supported by tape-recorded commentaries on each subject.

Since September, 1965, the Publicity Unit projected cine-films relating to rubber manufacture, soil conservation and films borrowed from the department of Agriculture and Embassies dealing with subjects of agricultural interest. The new 16 mm cine-film projector and the new power unit were used for this purpose. Since the new generator came into use no exhibits were being taken from the Smallholdings Headquarters and only local exhibits collected by the Rubber Instructors were displayed at the exhibitions. The cine-film shows were well attended and smallholders appreciated them very much.

In addition to the above, the Publicity Unit participated in the following exhibitions :—

- | | |
|---|---------------------------------------|
| 1. Minhindu Maha Vidyalaya, Agalawatta | ... 14th — 16th March |
| 2. Yakella and Getiyamulla Maha Vidyalaya,
Undugoda | ... 25th — 26th June |
| 3. Dharmapala Vidyalaya, Pannipitiya | ... 17th — 19th Sept. |
| 4. Rural Development Society, Higgoda | ... 25th — 26th „ |
| 5. Multi - departmental Exhibition Mayurapada
Vidyalaya, Mawanella | ... 13th November |
| 6. Government Training College, Mirigama | ... 27th November to
3rd December. |

LECTURES, DEMONSTRATIONS AND TRAINING CLASSES

Lectures

The Divisional Advisory Officers visited, on request, the Government Farm Schools at Ambepussa, Horana, Karapincha, Batangala, Wagolla and the Belgalkorale Rural Development Society and Kantha Samithi. Rubber Instructors visited, on request, the Rural Development Seminar at Maduluwawa, the Rural Development Training Class at Dehiowita and the Multi-department Co-ordinated Educational Programme meeting at Wenivelkaduwa. At these places the Divisional Advisory Officers conducted a series of lectures in Sinhala on rubber planting, sheet manufacture and allied subjects to the students taking courses in practical agriculture. The Rubber Instructors gave lectures on rubber planting in Sinhala with special references to the work done by this department for smallholders.

Meetings attended by officers of the Smallholdings Department

1. *Tumpalatha Pattu Development Scheme* :
Attended by Rubber Instructor, Mawanella.
2. *Wenivelkaduwa/Puwakella Wijaya R. D. Society* :
Attended by Divisional Advisory Officer, Kegalla.
3. *Food Production Committee, Office of the Divisional Revenue Officer Kegalla*
Attended by Divisional Advisory Officer, Kegalla.
4. *Training Course at the Institute of Training and Research in Community Development at Peradeniya*
Seminar — attended by Rubber Instructors of Hiniduma and Akuressa.

Demonstrations

Rubber Instructors conducted 817 sheet-making demonstrations, 744 tapping, 445 disease control and 413 miscellaneous demonstrations on other planting topics during the year.

For the purpose of improving smoking of smallholder's sheet rubber, Instructors paid 1,013 and 2,413 visits to demonstration and ordinary smoke houses. They persuaded smallholders to commence building 54 demonstration smoke houses and 72 ordinary smoke houses of which 42 demonstration and 44 ordinary smoke houses were satisfactorily completed. A grant of Rs. 75/- was paid to each demonstration smoke house completed.

Training classes

The scheme of training smallholders in rubber tapping, manufacture of sheet and other allied subjects on rubber was continued this year also. All applications for the training classes were received by the end of April 1965 and 51 classes were started. Later, 5 classes had to be abandoned owing to very poor attendance and 46 classes were successfully completed. 738 applicants participated in the classes and 651 were successful and received certificates (Table II). The first of the classes commenced session in the first week of June, 1965 and 2 classes were held weekly at each place for a duration of 8 weeks making 16 classes in all at each place of training.

ANNEXURE 2

CEYLON
 SULPHUR DUSTING SCHEME 1965
 Showing
 Distribution of dusting "Groups"



Rubber



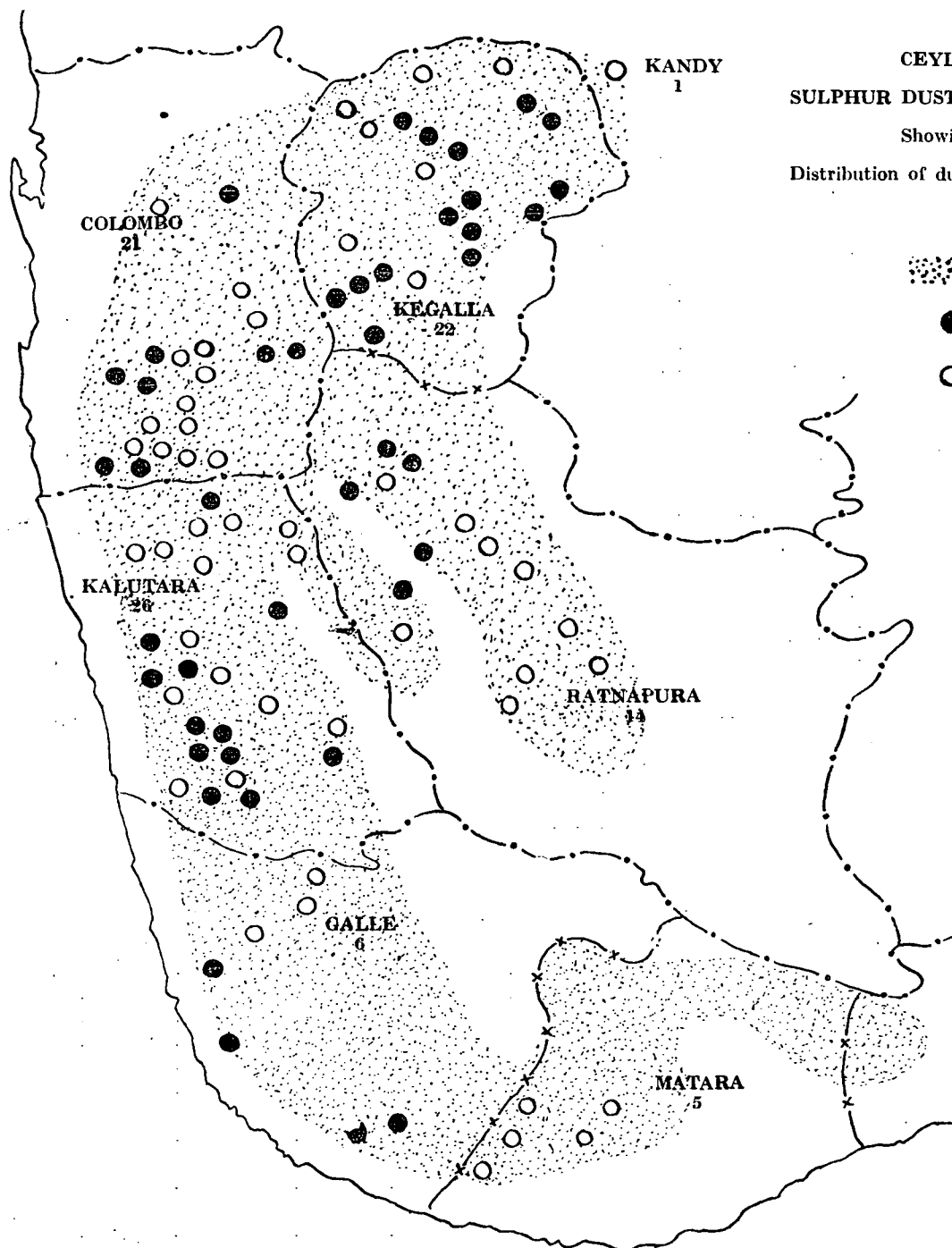
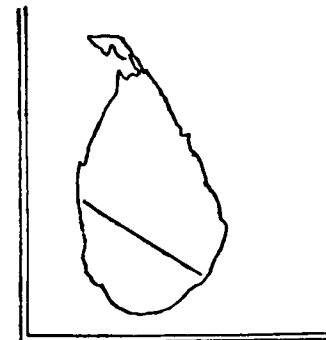
Groups Dusted



Groups Accepted (but not dusted)

No. of Groups Accepted

Colombo District	21
Kalutara „	26
Kegalla „	22
Galle „	6
Matara „	5
Ratnapura „	14
Kandy „	1
	<hr/> 95



ESTATE DEPARTMENT

By

L. WIJEYEGUNAWARDENE

Acreage summary — Dartonfield Group

	Dartonfield			Nivitigalakele			Hedigalla			Total		
	A.	R.	P.	A.	R.	P.	A.	R.	P.	A.	R.	P.
Rubber												
Mature	72	3	19	95	2	31	665	2	32	834	1	2
Immature	45	3	0	50	3	28	42	1	20	139	0	8
Nurseries	3	2	0	8	3	7	—	—	—	12	1	7
Total	122	0	19	155	1	26	708	0	12	985	2	17
Abandoned	8	3	0	—	—	—	2	3	35	11	2	35
Building sites etc.	40	2	36	15	1	33	8	1	18	64	2	7
Pinewood plantation	—	—	—	—	—	—	1	0	34	1	0	34
Roads	6	2	22	0	3	27	9	0	4	16	2	13
Swamp areas	—	—	—	0	2	8	0	2	20	1	0	28
Stream and reservations	—	—	29	—	—	—	13	0	29	13	1	18
Jungles etc.	—	—	—	1	3	38	395	0	0	396	3	38
	178	1	26	174	1	12	1138	1	32	1491	0	30

Visiting Agent

Mr. W. B. Jonklaas inspected the properties on 12th and 13th March 1965 and his report was submitted to the Rubber Research Board. He resigned in mid year.

Mr. Jonklaas was succeeded by Mr. M. W. Thompson who paid a visit of inspection on 22nd September 1965. His report on this visit was submitted to the Rubber Research Board.

Weather (Estate Gauge)

Comparative rainfall figures (inches) for 1965 are given

Month	Dartonfield		Nivitigalakele		Hedigalla	
	1965	1964	1965	1964	1965	1964
January	2.30	8.37	3.48	6.31	5.25	9.83
February	7.06	6.93	8.24	5.22	7.73	6.06
March	13.02	14.71	10.83	12.43	10.47	15.80
April	16.21	10.75	13.25	9.40	17.05	16.23
May	27.37	29.37	23.30	29.68	31.31	35.41
June	9.40	15.65	7.17	13.40	11.18	16.97
July	7.91	28.35	8.11	24.15	4.40	28.48
August	25.40	8.37	19.92	9.92	17.63	8.43
September	26.13	19.15	20.07	15.24	19.29	21.48
October	22.47	25.45	21.92	19.88	17.39	27.22
November	16.76	10.97	14.31	11.96	16.03	16.07
December	12.31	9.50	8.84	11.44	19.41	10.81
	186.34	187.57	159.44	169.03	177.14	212.79

Average (5 year period)	196·42 [#]		173·70 [#]		199·59 [#]	
Total No. of Wet days	231	235	202	240	241	279

The rainfall for the year at Dartonfield, Nivitigalakele and Hedigalla Divisions amounted to 186·34", 159·44" and 177·44" on 231, 202 and 241 days respectively and was below the quinquennial average. The first quarter of the year was comparatively dry with prolonged drought conditions. The month of August was very wet and July was an exceptionally dry month.

Crop

Weather conditions during the season under review have been more favourable for the harvesting of crop than last year. There was a fair amount of interference with crop intake during the third and fourth quarters of the year at Dartonfield and Nivitigalakele. The distribution of the rainfall at Hedigalla Division during the same period severely hampered tapping days, entailing heavy loss in crop as this division forms the major part of the crop on the Group. The envisaged number of covery tappings at Hedigalla Division could not be achieved. It should however be appreciated that Hedigalla Division normally loses approximately 50 tapping days per annum over that of Dartonfield and Nivitigalakele due to rain.

		1965	1964
Estimated	...	700,000 lb	600,000 lb
Harvested	...	579,117 ,,	540,073 ,,
Deficit	...	120,883 "	59,927 ,,

The crop harvested for the year 1965 = 82·73% of the season's estimate.

Comparative Yield Records of Individual Fields

Dartonfield	Acreage in tapping	Total yield in lb		Yield in lb per acre	
		1965	1964	1965	1964
* 1938 Replanted Area	—	—	6,445	—	1,432·2
* 1941 " "	—	—	5,389	—	1,077·8
* 1947 " "	—	—	6,120	—	1,530·0
1950/51 " "	25½	16,004	17,875	621·5	694·2
1952 " "	27	27,295	26,104	1,010·9	966·8
1953 " "	8	6,770	4,880	846·2	424·4
1954 " "	2½	1,674	1,684	669·6	217·3
1955 " "	5	2,427	2,197	485·4	439·4
1955/56 " "	4¾	2,836	2,248	597·0	473·2
	73	57,006	72,942	780·9	765·8
<i>Nivitigalakele</i>					
** 1935 Replanted Area	8½	3,419	18,932	402·2	1,023·3
1939 " "	10½	15,573	9,200	1,519·3	987·6
1940 " "	9¾	14,702	10,550	1,507·9	1,082·1
1940 Swamp Area	3½	3,090	3,556	950·7	1,094·0
1941 Clearing	7	10,389	8,330	1,484·1	1,198·9
1942 " "	4½	6,460	4,941	1,435·5	1,067·9
1943 " "	7	6,126	4,956	875·1	707·8
1944 " "	4½	5,650	4,730	1,255·5	1,051·0
1946 " "	21	20,255	27,631	1,439·3	1,315·7
1953 " "	10	10,073	9,464	1,007·3	946·4
1954 " "	10	9,853	9,511	985·3	951·1
	95½	115,560	111,801	1,206·9	1,057·2

<i>Hedigalla</i>	Acreage in tapping	Total yield in lb		Yield in lb per acre	
		1965	1964	1965	1964
1943 Clearing	10 $\frac{1}{4}$	8,560	11,254	835.1	1,098.0
1944 "	11 $\frac{3}{4}$	8,676	11,628	738.4	989.6
1945 "	22 $\frac{1}{4}$	14,566	14,470	654.6	650.3
1946 "	12 $\frac{3}{4}$	10,246	5,865	803.6	460.0
1947 "	45	23,920	26,324	531.5	585.0
1949 "	34 $\frac{3}{4}$	30,279	27,768	871.3	799.1
1950/51 "	18	13,090	13,758	727.2	764.3
1952 "	79 $\frac{1}{2}$	60,319	45,194	758.7	568.5
1953 "	131	86,536	75,322	660.6	575.0
1954 "	172 $\frac{1}{2}$	80,691	72,910	467.8	448.7
1955 "	78	49,519	35,400	634.8	453.9
1956 "	48	20,149	15,437	419.8	385.9
	<hr/> 663 $\frac{3}{4}$ <hr/>	<hr/> 406,551 <hr/>	<hr/> 355,330 <hr/>	<hr/> 612.5 <hr/>	<hr/> 550.3 <hr/>
Total for the Group	832 $\frac{1}{2}$	579,117	540,073	605.6	637.8
Other sources		806	245		
Total		<hr/> 579,923 <hr/>	<hr/> 540,318 <hr/>		

* Replanted in 1965. ** Uprooted for replanting 1966.

Tapping

The non-experimental areas were tapped throughout the wintering period. Tapping panels were marked with the appropriate bark consumption. Tapping was resumed in the non-experimental areas after winter rest during refoliation. A six year replanting programme was implemented.

Analysis of tapping rounds on Dartonfield Group for 1965 (1964 figures in brackets)

<i>Dartonfield</i>	Early Tapping	Late Tapping	Winter Rest	No Tapping Rain	Holidays
1st quarter	76 (70)	12 (19)	— —	1 (1)	1 (1)
2nd "	48 (49)	22 (16)	— —	17 (23)	4 (3)
3rd "	40 (37)	27 (20)	— —	23 (35)	— —
4th "	53 (57)	24 (19)	— —	14 (16)	1 —
	<hr/> 217 (213) <hr/>	<hr/> 85 (74) <hr/>	<hr/> — (—) <hr/>	<hr/> 57 (75) <hr/>	<hr/> 6 (4) <hr/>
<i>Nivitigalakele</i>	Early Tapping	Late Tapping	Winter Rest	No Tapping Rain	Holidays
1st quarter	79 (71)	9 (16)	— —	1 (3)	1 (1)
2nd "	37 (52)	29 (14)	— —	19 (20)	6 (5)
3rd "	39 (40)	32 (20)	— —	21 (32)	— (—)
4th "	52 (48)	25 (28)	— —	15 (15)	— (1)
	<hr/> 207 (211) <hr/>	<hr/> 95 (78) <hr/>	<hr/> — — <hr/>	<hr/> 56 (70) <hr/>	<hr/> 7 (7) <hr/>
<i>Hedigalla</i>	Early Tapping	Late Tapping	Winter Rest	No Tapping Rain	Holidays
1st quarter	72 (64)	9 (5)	— —	9 (22)	— (—)
2nd "	35 (40)	19 (10)	— —	32 (37)	5 (4)
3rd "	34 (38)	18 (5)	— —	40 (49)	— —
4th "	46 (50)	25 (11)	— —	21 (31)	— —
	<hr/> 187 (192) <hr/>	<hr/> 71 (31) <hr/>	<hr/> — (—) <hr/>	<hr/> 102 (139) <hr/>	<hr/> 5 (4) <hr/>

Manufacture

A summary 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 Sheet No. 1	10,864	1·88
" " " 2	2,240	0·39
" " " 3	2,422	0·42
Pale Crepe No. 1	331,438	57·23
" " " 2	51,274	8·85
" " " 3	99,829	17·24
Latex for experiments	1,240	0·21
	<hr/>	<hr/>
	499,307	86·22
	<hr/>	<hr/>
Scrap No. 1	48,876	8·44
" " 2	20,802	3·59
" " 3	10,132	1·75
	<hr/>	<hr/>
	79,810	13·78
	<hr/>	<hr/>
Total	579,117	100·00
	<hr/>	<hr/>
From outside sources	806	
	<hr/>	
Total	579,923	
	<hr/>	

Difficulties are envisaged in the manufacture of a uniform No. 1 crepe as the Hedigalla Division crop increases, which consists of experimental areas of numerous clones under test.

Miscellaneous

Field and factory experiments.—The Rubber Chemistry, Botany, Plant Pathology and Soils Divisions were given assistance in carrying out their field and factory experiments.

Estimates.—Estimates of capital and revenue expenditure for 1966 in respect of Dartonfield Group, prepared and submitted by the writer to the Rubber Research Board, were approved.

Estate Road.—All motorable roads and paths were maintained in good order throughout the year.

Manuring.—Mature areas of the Group received fertilizers in accordance with the Institute's recommendations.

PESTS AND DISEASES

Oidium heveae

Weather conditions this year were more favourable than in the past few years for the incidence and spread of *Oidium*. Wintering was very uneven. Sulphur dusting was carried out throughout February, March and April. The early winterers refoliated satisfactorily but the late winterers suffered most. The numerous clones on a per acre basis, planted in close proximity and the irregular wintering of trees no doubt presented difficulties in control of the disease, resulting in protracted spot dusting till April particularly on Hedigalla Division. A satisfactory control was however achieved.

Gloeosporium alborubrum

This was negligible.

Phytophthora palmivora

Factors unfavourable to the build up of inoculum and to the activity of the fungus which was considerably inhibited prevailed throughout the South West monsoon period. A very mild leaf-fall was experienced in August/September particularly in Hedigalla Division. The dusting technique employed using copper-based fungicides proved adequate and effective.

Bark Rot

The incidence of Bark Rot was negligible. The organo-mercurial fungicides Antimucin and Kankerdood, proved effective.

Wind damage

The loss of trees due to wind damage on Dartonfield, Nivitigalakele and Hedigalla were 15, 56 and 393 trees respectively.

CAPITAL ACCOUNT — AGRICULTURAL DEVELOPMENT

<i>Dartonfield Division — Immature Areas</i>			
1960/61 Replanted Area	...	31½	...
1965 Replanting	...	14½	... 48½ acres
<i>Nivitigalakele Division — Immature Areas</i>			
1962 Replanted Area	...	16¾	
1963 „ „	...	14	
1964 „ „	...	10	
1965 Replanting	...	10	... 50¾ acres
<i>Hedigalla Division — Immature Areas</i>			
1956 Clearing	...	12	... 42¼ acres
1957 „ „	...	17¼	
1965 Replanting	...	13	

Routine weeding, cultivation and other agricultural operations were carried out. The immature areas are in good condition and were maintained up to the required standards of sound agricultural practice.

Number of trees uprooted — Immature Areas

<i>Nivitigalakele</i>	1962 Replanted Area	—	<i>Feses lignosus</i> ...
			Wind Damage ...
	1963 Replanted Area	—	<i>Fomes lignosus</i> ...
	1964 Replanted Area	—	<i>Fomes lignosus</i> ...
<i>Hedigalla</i>	1965 Replanted Area	—	<i>Fomes lignosus</i> ...
	1956 Clearing	—	<i>Fomes lignosus</i> ...

1961 Replanted Area (31½ acres) at Dartonfield.— This area carries two tapping tasks of each of the clones RRIC 7, RRIC 45, RRIC 52, RRIC 88, RRIC 89, PB 28/59, PB 86 and RRIM 513. Growth is good. The area was well weeded and manured and attention given to root diseases.

1962 Replanted Area (16¾ acres) at Nivitigalakele.— This area was planted with the following clones: RRIC 5, RRIC 39, RRIC 51, RRIC 86, RRIC 90, RRIC 91, RRIC 92, RRIC 93, RRIC 94, RRIC 95, RRIC 96, RRIC 97, PB 86, IAN 45 - 717, RRIM 623, RRIM 628, RRIM 701 and 17 ten-tree clones. Growth is quite satisfactory, but as reported earlier fairly uneven due to the variability of the growth characteristics of each clone. Weeding, manuring and attention to root diseases were carried out.

1963 Replanted Area (14 acres) at Nivitigalakele.— This is planted with five plots of 300 points each of clones RRIC 59, RRIC 60, RRIC 64, RRIC 75 and PB 86 and four plots of 150 points each of clones RRIC 6, RRIC 39, RRIC 41 and RRIC 98. A further 150 points of PB 86 were planted. The growth is satisfactory. Routine agricultural operations were carried out with special attention given to root diseases.

1964 Replanted Area (10 acres) at Nivitigalakele.— This is planted with four clones: RRIC 41, RRIC 45, RRIC 52 and RRIC 86. The growth of plants is very satisfactory. Routine agricultural operations were carried out.

1965 Replanting

(a) *14½ acres at Dartonfield.*— The planting of this area was undertaken during the South West monsoon and was completed in May with the following material: 5 point buddings of H.P. seedlings, RRIC 45, RRIC 88, RRIC 89, RRIC 90, RRIC 91, and RRIM 600. *Desmodium ovalifolium* and *Pueraria* self sown covers have been established and spreading well. Growth though uneven is good. Close attention was paid to weeding, manuring and root diseases.

(b) *10 acres at Nivitigalakele.*— The planting of the area, carried out in the 1st week of May and consists of a monoclonal block of RRIC 45. Growth is very satisfactory, and the *Desmodium* covers are coming on well. Routine agricultural operations were carried out.

(c) *11½ acres at Hedigalla.*— This area is made up of sixteen small plots scattered over different fields and sandwiched among planted rubber. The originally planted material consist of LCB 870 buddings. These sixteen plots were replanted with RRIC 52 budgrafts during the South West monsoon. Growth is comparatively poor. The covers are coming on satisfactorily.

1966 Replanting

(a) *8 acres at Nivitigalakele.*— Uprooting and clearing operations were undertaken. This would be ready for planting in the South West monsoon in 1966.

(b) The 22½ acres at Hedigalla due for replanting in 1966 postponed for planting in 1967.

NURSERIES

Seedling and budwood nurseries — Dartonfield

(a) Routine weeding and clearing of drains were carried out in all the nurseries. Plants were manured in accordance with the Institute's recommendations.

(b) Plants bearing over-matured budwood were lopped.

Seedling and Budwood Nurseries — Nivitigalakele

(a) Weeding, clearing of drains and manuring were done.

(b) Vigorous-growing stocks in these nurseries were budded to meet the following requirements :

Botany Division Experiments	...	1,977	budded stumps
Nivitigalakele Replanted Areas	...	1,671	„ „
Nivitigalakele Budwood Nurseries	...	23	„ „
Dartonfield Replanted Areas	...	471	„ „
Plant Breeding Section	...	150	„ „
Total	...	<u>4,292</u>	„ „

Budwood issues

Outside estates	...	275	Yards
Botany Division Experiments	...	954	„
Nivitigalakele Budgrafting	...	518	„
Total	...	<u>1,747</u>	„

LABOUR AND HEALTH

(a) *Labour force.*— The regular labour force was adequate and generally settled.

(b) *Line rooms.*— Line room accommodation was satisfactory. Routine repairs to cottages, where necessary, were carried out accordingly.

(c) *Wages.*— 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 ...	116	184	300
Women ...	94	153	247
Children ...	—	—	—
<i>Working Immigrants</i>			
Men ...	39	—	39
Women ...	25	—	25
Children ...	—	—	—
	<hr/> 274	<hr/> 337	<hr/> 611

(d) *Annual holidays*.— Annual holidays with pay were given to all labourers who were entitled to these in accordance with the Ordinance.

(e) *Maternity benefits*.— Thirty-five full maternity benefits and five medical wants benefit payments were made.

(f) *Feeding children and milk food*.— Free rations and $\frac{1}{4}$ lb bread were issued to each non-working child. Milk foods were issued to all infants whose mothers were incapable of nursing them.

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

(h) *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.

(i) *Births*.— Nine children were born during the year on the Group,

(j) *Deaths*.— There were two deaths on the Group this year.

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

Influenza	...	...	2,952
Ulcers	...	...	821
Ankylostomiasis	...	...	427
Diarrhoea and Enteritis	...	...	934
Ear diseases	...	...	22
Other diseases	...	...	6,242
		<hr/> Total ...	<hr/> 11,398

RUBBER REPLANTING SUBSIDY SCHEME NURSERY AT HEDIGALLA

Supervision.— The Estate Superintendent, R.R.I.C., paid supervisory visits to this nursery during the year.

Staff.— Mr. L. Samaranayake, Assistant Nursery Manager.

Rainfall.—117·14 inches were recorded this year as against 212·79 inches in 1964. There were 241 wet days in the year.

Seedling nursery

(a) The nursery acreage of 57 remained unchanged. In accordance with the decision of the Rubber Replanting Advisory Board, one third of the total nursery acreage was allowed to be fallow for one year on a three-year rotation scheme. The area not planted was sown with *Crotalaria anagyroides*.

(b) Ten acres of nursery beds were prepared during the second quarter of the year to receive Tjir 1 seed from the July/August seed-fall. This area was planted in September/October.

Maintenance.—The seedling and budwood nurseries were satisfactorily maintained throughout the year. Routine agricultural operations were carried out.

Pests and diseases

(a) The incidence of *Oidium* was fairly heavy and regular rounds of sulphur dusting was carried out in March/April.

(b) A mild attack of *Phytophthora* and *Gloeosporium* was observed during the months of August/September necessitating spraying with Colloidal Copper as recommended by the Visiting Agent.

Planting material.—The issues of planting material from this nursery by the Rubber Control Department during 1965 was as follows :

	<i>S. W. Planting</i>	<i>N. W. Planting</i>	<i>Total</i>
Clonal seedlings ...	9,814	15,943	25,757
Budded stumps ...	13,822	43,840	57,662
	<u>23,636</u>	<u>59,783</u>	<u>83,419</u>

Budwood of PB 86 and RRIC 52 were available on site from the budwood nurseries.

Estimates.—An estimate for maintenance of the Nursery for 1965 was prepared and submitted to the Rubber Replanting Advisory Board.

Visiting Agent.—Mr. E. O. B. Lover paid regular visits to this nursery.

R.R.I.C. SUB-STATION, KURUWITA

By

B. COCKING

Acreage

		<i>A.</i>	<i>R.</i>	<i>P.</i>
Mature polyclonal	...	30	1	23
Replanted 1961	...	83	3	20
—do— 1962	...	38	3	00
—do— 1963	...	22	1	37
—do— 1964	...	18	2	09
—do— 1965	...	18	2	27
Uprooted for replanting in 1966	...	10	0	00
Nurseries	...	1	1	24
Roads, deniya, forests and buildings	...	23	2	10
Total	...	247	2	30

With the uprooting of 10 acres of pre-war polyclonal rubber for replanting in 1966, we now have only thirty acres balance which is under varying degrees of intensive tapping prior to uprooting for replanting over the period 1966 to 1969.

Staff

Both our S.F.A., Mr. H. B. H. de Silva, and our Rubber-maker/K.P., Mr. G. D. A. Weerasooriya, were transferred to other departments towards the end of the year and have been succeeded by Mr. M. C. Perera as Acting S.F.A., and Mr. Amara-pala as temporary Rubber-maker/K.P. Mr. W. B. Jonklaas, our Visiting Agent, resigned subsequent to accepting a partnership in a Colombo Agency House, and has been succeeded by Mr. M. W. Thompson. There have thus been considerable changes during the year.

Weather

Comparative figures for 1964 and 1965

		1964	1965
January	...	6.63	4.31
February	...	5.25	4.68
March	...	12.48	7.77
April	...	19.12	15.53
May	...	29.83	32.42
June	...	12.22	9.69
July	...	29.58	5.21
August	...	11.20	30.88
September	...	16.45	18.31
October	...	23.61	15.08
November	...	12.94	9.61
December	...	5.05	9.39
Total	...	184.36	162.88

Until the early part of March conditions were mainly dry and a short drought also occurred during the period June/July. August was excessively wet but for the remainder of the year weather conditions followed the normal pattern for this district.

Crop

	1964	1965
Estimated	35,400 lb	26,000 lb
Secured	40,037 „	48,491½ „

Due to the intensification of tapping our estimated crop for the season was exceeded by 22,491½ lb or nearly double the original estimate.

Tapping

	1964	1965
Estimated cost	28.00	25.00
Actual cost	24.27	21.93

The cost of tapping at 21.93 cts. per lb is the lowest achieved since the inception of this Sub-station. The average intake per tapper being 17.13 lb. Out-turn was also exceptionally good at 99.72%.

Weeding

Weeding in the old mature areas was restricted to the removal of cheddies and other insipient jungle growth at a cost of Rs. 423/94 which exceeded the estimate by Rs. 123/94.

Buildings

Staff bungalows have been colour-washed, and minor repairs have been carried out during the year. Labourers' cottages are all in good order and minor buildings have been well maintained. The water filtration plant has also been dismantled and repaired and is now in good order.

Roads

The main cart road and all field roads are in good order and sign boards will shortly be erected at approach road junctions.

Manufacture

We continue to produce smoked sheet from our latex crop whilst our scrap is despatched unmanufactured. Our overall sales average for the year was 78 cts. per lb with a 80% out-turn of smoked sheet. Precoagulation caused by intensive tapping militates against a higher percentage of No. 1 sheet at present.

Machinery is in good order and the diamond roller is being marked with the letters "KW" so that our sheets may be more readily identified

Curing cost estimated	...	7.50 cts. per lb	
—do— spent	...	7.67	—do—
Fuel for power estimated	...	7.84	—do—
—do— spent	...	3.47	—do—

Labour

Labour statement as at 31st December, 1965

Working men	...	9
—do— women	...	8
Non-working adults	...	13
—do— children	...	31
		—
Total	...	61
		—

The labour force has worked very well during the year and there has not been any unrest other than some minor agitation from a small group of ex-Paradise labourers. Five Labour Tribunal applications were dismissed during the year.

Clearings

Replanting 1961-1964 — 163 $\frac{3}{4}$ acres

All these clearings have made good progress during the year although Mikania made weeding very difficult especially in low lying areas, and over-expenditure totalled Rs. 31/05 per acre. Test tapping was commenced in the 1961 clearing.

Replanting 1965 — 19 acres

This clearing was planted in two blocks in May 1965, in clones RRIC 41, 52 and 45, and also RRIM 623. The plants are growing well and cover crops have been established.

Summary of costs

Revenue expenditure estimated	Rs. 23,072/-	being	88·74	cents per lb
—do— spent	Rs. 32,035/22	,,	66·06	—do—

General

Harvests during the year have been very satisfactory and revenue cost of production of 66·06 cts. per lb is approximately 23 cts. per lb below the estimate of 88·74 cts.

The Sub-station is in good agricultural order.

We would like to record our appreciation of the useful advice and assistance rendered by Mr. W. B. Jonklaas during the time he was our Visiting Agent.