THE

RUBBER RESEARCH INSTITUTE OF CEYLON

3rd & 4th QUARTERLY JOURNALS

Vol. 43 Parts 3 & 4 September/December 1967

ANNUAL REVIEW FOR 1966

CONTENTS

THE RUBBER RESEARCH INSTITUTE OF CEYLON

(STAFF AS AT 31ST DECEMBER, 1967)

Director .. R. T. Wijewantha, B.Sc. (Cey.), B.Sc. (Special) Hons. (Lond.), M.Sc. (Lond.), Ph.D. (Calif.), M.Sig. Xi, M.I.Biol.

RESEARCH DEPARTMENTS

Botany

Head of Department .. L. B. Chandrasekera, B.Sc. (Cey.), Dip. Ag. Sci. (Cantab.)

Assistant Botanists .. R. Satchuthananthavale, B.Sc. (Madras), M.A. (Madras), Ph.D. (Sheffield)
Miss A. C. I. Yahampath, B.Sc. (Cey.)

Senior Technical Assistant .. W. G. V. Fernando

Technical Assistant .. C. Amaracone

Field Assistants .. D. A. Brahakmana
D. R. Colonne
U. K. D. Lewis
W. T. Silva

Genetics and Plant Breeding

Head of Department .. D. M. Fernando, B.Sc. (Cey.), M.Sc. (Mc-Gill)

Geneticist .. Y. D. A. Senanayake, B.Sc. Agric. (Cey.), M.S. (Louisiana), Ph.D. (Calif.)

Technical Assistant .. P. Samaranayake

Senior Field Assistant .. H. B. H. de Silva

Field Assistants .. D. S. Gamage
A. K. M. S. Senaratne
W. A. C. Wijesinghe

Plant Pathology

Head of Department .. Vacant

Assistant Plant Pathologist .. Mrs. V. Satchuthananthavale, B.A. (Madras), M.Sc. (Madras), Ph.D. (Sheffield)

Senior Technical Assistant .. H. L. Munasinghe, L.I.Biol.

Technical Assistants .. D. M. Dantanarayana
W. C. Dayaratne
T. M. Fernando
Z. E. Irugalbandara
E. G. Mendis
S. K. Samaraweera

Soils Chemistry

Head of Department .. Vacant

Soils Chemist .. C. G. Silva, B.Sc. (Cey.), M.S. (Hawaii)

Assistant Soils Chemist .. *R. S. John, B.Sc. Ag. (Cey.)

Senior Technical Assistant .. T. Kanthasamy

Technical Assistants .. H. A. Seemon
F. P. W. Silva

Field Assistants .. W. M. Abeysinghe
M. A. Mendis
J. T. K. V. Nageswaran

Rubber Chemistry

Head of Department .. Vacant

Rubber Chemist .. S. W. Karunaratne, B.Sc. (Cey.), A.R.I.C., A.I.R.I., A.N.C.R.T., M.Sc. (Aston)

Assistant Rubber Chemist .. Mrs. J. Sivabalasunderam, B.Sc. (Madras), A.R.I.C.

Senior Technical Assistant .. M. T. Veerabangsa

Technical Assistants .. A. S. Dekumpitiya
W. D. Dharmasena
G. G. Gnanasegaram
D. D. Medagama

Statistical Section

Assistant Statistician	..	N. Nadarajapillai, B.Sc. (Cey.)

EXTENSION SERVICES

Estates Advisory Department

Head of Department	..	A. B. Dissanayake, B.Sc. Ag.(Cey.), B.A. (Cey.)
Estates Advisory Officer	..	K. W. de Silva
Assistant Advisory Officers	..	A. Dahanayake, B.Sc. Ag. (Cey.)
		D. S. Muthukuda
		H. T. Wickremasekera, B.Sc. Ag. (Cey.)

Smallholdings Department

Chief Advisory Officer (Smallholdings)	..	H. H. Peiris
Deputy Chief Advisory Officer (Smallholdings)		Vacant
Divisional Advisory Officers (Smallholdings)		P. S. G. Cooray
		M. B. Dissanayake
		B. D. Pedrick
		D. R. Ranwala
		K. P. Siriwardena
		J. D. S. Wickremaratne
		D. B. Weligodapola
		L. A. Wijesinghe
Office Assistant	..	R. A. Somadasa
Chief Clerk	..	C. Jayasinghe
Clerk-Translators	..	W. A. A. Perera
		I. L. Sirisena
Clerks	..	M. Jayasuriya
		M. J. P. Lusena
		G. P. A. I. G. Pathirana
		R. E. Perera
		K. J. L. Perera
		A. Wijesinghe
Mechanic	..	K. A. Siripala
Rubber Instructors	..	W. D. Abeysena
		D. L. Abeysinghe
		M. D. Albert
		H. A. D. Ariyaratne
		K. I. Ariyaratne
		S. D. Athukorale
		W. S. Dassanayake
		P. W. David
		W. E. W. de Mel
		A. J. L. de Silva
		H. R. Dias
		J. M. E. Dissanayake
		K. Ekanayake
		P. B. Fernando
		P. I. N. Fernando
		P. T. S. Fernando
		R. Gunadasa
		L. L. C. Gunasekera
		W. W. Gunasekera
		U. D. V. Gunasinghe
		A. P. Gunatilake
		R. K. Gunatilake
		B. A. Gurusinghe
		G. P. G. S. Hapugoda
		R. B. Heendeniya
		T. B. Herath
		D. Hettiarachchi
		S. D. Hidellearachchi
		T. W. Jayalath
		A. K. Jayatissa
		W. D. Jayawardena
		K. S. Kodikara
		R. B. Madawala
		P. R. Nonis
		D. Palihakkara
		M. P. V. P. S. Perera

Rubber Instructors (Contd.)	..	S. C. Rajasinghe
		D. J. Ratnayake
		W. D. D. Rupasinghe
		M. C. Samarasekera
		R. G. Siripala
		U. S. Somapala
		J. H. Suaris
		J. Sumanasekera
		A. Suriyaarachchi
		O. M. W. Tillekeratne
		G. Weeratunge
		C. Wickrematilake
		U. S. Wijeyapala (R.I., Propaganda)
		W. S. Wijesekera
		V. Wijesinghe
		D. R. Wijesooriya
		W. M. D. Wijesundera
		R. P. D. J. Wijewardena

ADMINISTRATION

Correspondence and Accounts Sections

Chief Administrative Officer and Secretary to the Board	..	B. C. Moldrich, B. A. (Cey.)
Assistant Administrative Officer	..	Vacant
Office Assistant	..	J. A. Attygalle
Accounting Assistant	..	H. Kulasena, A.C.C.S.
Personal Assistant to the Director	..	P. Samarasinghe
Clerks	..	M. J. Abeyasinghe
		D. D. D. Adikaram
		A. K. D. Amaradasa
		K. G. A. K. Dharmawardena
		J. D. Gunaratne
		A. L. Gunawardena
		W. D. Jayawansa
		J. H. C. S. Perera
		Miss N. K. Seneviratne
		D. G. Udawatta
		T. H. Wijesena
		P. S. P. Wijesiriwardena
		B. H. Withanachchi
Book-keeper	..	E. P. D. Roberts, F.C.B.I. (Lond.)
Translator cum Typist	..	J. A. A. R. I. St. R. Perera
Store-keeper	..	D. P. W. Goonesekera
Stores Assistant	..	B. L. P. Gunaratne

Library

Librarian & Publications Officer	..	Vacant
Library Assistant	..	W. Ranasinghe
Clerk	..	D. C. Thambawita

Works Section

Works Engineer	..	P. C. J. F. Keerthisinghe
Foremen	..	M. M. Anderson
		W. S. J. Benjamin
		K. C. L. Fernando
Clerk	..	E. T. Seneviratne
Transport Stores Assistant	..	B. D. Ponnamperuma

ESTATES

Dartonfield Group

Estate Superintendent	..	L. Wijeyegoonewardena
Assistant Estate Superintendent	..	M. R. T. Mendis
Office Assistant	..	T. S. J. Peiris
Senior Accounts Clerk	..	A. C. Swaris
Clerks	..	C. Jeyaraj
		A. L. Ratnayake
		B. H. Rodrigo

Chief Field Assistant	..	H. M. Buultjens
Senior Field Assistants	..	L. P. de Mel
		D. C. Kannangara
Factory Assistant	..	O. de Alwis
Apothecary	..	P. H. A. Perera
Dispenser	..	G. P. A. Silva
Field Assistant	..	H. A. Haramanis
Assistant Rubber Maker		S. Hettiarachchi
School Teachers	..	Mrs. K. P. Goonewardene
		D. L. W. Lionel
		S. Nadarajah
Assistant Nursery Manager	..	L. H. Samaranayake

KURUWITA SUB-STATION

Visiting Superintendent	..	B. Cocking
Senior Field Assistant	..	M. C. Perera

Note :— Names of officers of a single group under each department have been alphabetically listed.

* on study leave overseas.

RUBBER RESEARCH INSTITUTE OF CEYLON

DIRECTOR'S REVIEW FOR 1966

By

RONALD T. WIJEWANTHA

A journal on rubber in which recent research findings are communicated to the layman — the natural rubber producer — in simple, non-technical language has been a long-felt need. A Bulletin has now been introduced to serve this purpose and also to provide a forum for the exchange of views and information on natural rubber.

With the establishment of an Estates Advisory Department, research personnel have been able to devote more time to problems of applied research. The extension of the advisory service to the smaller estates has at the same time, been received enthusiastically.

The Genetics and Plant Breeding Department which was dichotomised off from the Botany Division will now be able to concentrate on the evolution of new planting types, selection and early evaluation of such materials, as well as undertake fundamental cytogenetic studies.

At the request of the Planters' Association of Ceylon, the Estate & Experimental Committee of the Rubber Research Board was enlarged to include two experienced rubber planters to further represent the industry. Messrs. Denham de Alwis and L. C. de Mel were nominated by the Board to serve on this Committee with effect from March.

The Director attended a liaison meeting on biosynthesis of rubber and a meeting of the International Rubber Research and Development Board in Paris in July, 1966.

Dr. O. S. Peries, Head of the Plant Pathology Department visited Malaysia as the International Rubber Research & Development Board's Co-ordinator for research on leaf and panel diseases, at the request of the Rubber Research Institute of Malaya and participated in discussions on the control of an outbreak of *Phytophthora* leaf disease in Malaya.

Mr. M. Nadarajah, Head of the Rubber Chemistry Department, Mr. A. J. Jeevaratnam, Head of the Soils Chemistry Department and Mr. B.C. Moldrich, Chief Administrative Officer were on duty throughout the year.

Mr. L. B. Chandrasekera, Botanist was appointed Acting Head of the Botany Department and Mr. D. M. Fernando, Geneticist & Plant Breeder was appointed Acting Head of the Genetics & Plant Breeding Department with effect from 7th March.

Mr. A. B. Dissanayake, Head, Estates Advisory Department and Mr. K. Wilson de Silva, Estates Advisory Officer were on duty throughout the year. So also Mr. H. H. Peries, Acting Chief Advisory Officer Smallholdings and Mr. D. E. A. Abeywickrema, Acting Deputy Chief Advisory Officer Smallholdings.

Mr. L. Wijeyagoonewardene, Estate Superintendent, was on 4 months end-of-contract leave from 23rd September and Mr. M. R. T. Mendis, Assistant Superintendent was appointed to act in his place during his period of leave.

Mr. B. Cocking, Visiting Superintendent, R.R.I.C. Sub-station, Kuruwita continued to over-see the sub-station during the year.

Mr. Camillus Silva, Soils Chemist was on duty throughout the year.

Dr. R. Satchuthananthavale, Assistant Botanist, resumed duties at the Institute in December having returned to the island after successful completion of his post-graduate studies at the University of Sheffield. Dr. (Mrs.) V. Satchuthananthavale, Assistant Plant Pathologist, returned to the Island and resumed duties in the Plant Pathology Department in December after a 3-year period of successful post-graduate studies at the same university.

Mrs. S. C. Goonetilleke, Librarian & Publications Officer, who underwent training in documentation at the Documentation Research and Training Centre in Bangalore returned to the Island in November on completion of her studies.

Mr. S. W. Karunaratne, Assistant Rubber Chemist and Mr. V. B. Solomon, Assistant Statistician, continued their post-graduate studies abroad.

Mr. R. S. John, Assistant Soils Chemist, proceeded on a scholarship for post-graduate training at the University of Aberdeen in September.

The following Intermediate Staff officers were on duty :—

1. Mr. N. Nadarajapillai — Assistant Statistician
2. Mr. P. C. J. F. Keerthisinghe — Works Engineer
3. Mrs. J. Sivabalasunderam — Assistant Rubber Chemist

Miss A. C. I. Yahampath, B.Sc. (Ceylon), was appointed Assistant Botanist with effect from October 15th.

Mr. A. S. Nanayakkara, B.Sc. Econ. (London), was appointed Assistant Administrative Officer with effect from 1st April.

Mr. D. L. S. Wimalajeewa, Assistant Plant Pathologist left the services of the Institute in July.

Assistant and Minor Staff changes in the various Departments have been reported on by the respective departmental heads.

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

Senior Staff (Heads of Departments)	9
Senior Staff (non-Heads of Departments)	3
Intermediate Staff	13
Assistant Staff	155
Minor Staff	61
	241

Visitors :

The visitors to the Institute included the following :—

Mr. V. A. de Mauny, Rosehaugh Agency Ltd., London.
Mr. and Mrs. A. E. J. Emmet, Rosehaugh Agency Ltd., London.
Mr. H. Mayer of Sandoz Ltd., Basle, Switzerland.
Mr. A. J. Brink, Dow Chemicals International Inc., Hong Kong.
Mr. A. Fong Chu Chai of R.R.I., Malaya.
Mr. K. Yokohama, Tokyo, Japan.
Mr. S. Miyauchi, Tokyo, Japan.
Mr. K. Tomiyoshi, Tokyo, Japan.
Dr. K. M. Siriniwasam, Agromore Ltd., Bangalore.
Mr. A. Watson, I.C.I., United Kingdom.
Mr. J. d'Auzac, Institut Francais du Caoutchouc, Paris.
Mr. J. A. Barney of R.R.I., Malaya.
Mr. P. F. Baldink of Bata Shoe Co.
Professor J. E. Blackman, Department of Agriculture, Oxford.
Mr. I. W. Macer, England.
Dr. U. Werblow of Germany.
Mr. D. J. Coldwill, British High Commission.
Prof. V. Bojanansky, Czechoslovak Academy of Science, Czechoslovakia.
Dr. W. Klert of Oxford.
Dr. H. J. Stangel, Chemical Corporation of New York,
Mr. K. Otorii, Marubei Ida Co., Ltd., Tokyo, Japan.
Mr. S. Harada, Nissan Chemical Ind. Ltd., Tokyo, Japan.
Mr. N. Miyadera, Nissan Chemical Ind. Ltd., Tokyo, Japan.
Mr. P. Bertolotti, Milano, Italy.
Prof. and Mrs. A. R. Clapham, Sheffield, U.K.
Mr. George J. Ancheril, Vice-Chairman, Rubber Board, India.

Meetings Conferences, Seminars etc. :

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

1. Symposium on Rice sponsored by the C.A.A.S.
2. C.A.A.S. Annual Sessions.
3. Rubber Symposium organised by Carson Cumberbatch & Co., Ltd.
4. District Planters' Associations Meetings.
5. Meetings of the Standing Committee on Agro-chemicals.
6. Symposium organised by the Soil Conservation Society.
7. Joint meeting of the Royal Institute of Chemistry and Chemical Society of Ceylon.
8. Meeting of the Institution of the Rubber Industry.

Visits by Scientific Staff :

	Advisory	Experimental	Others	Total
Botany Department	21	39	9	69
Genetics & Plant Breeding Dept. ..	—	497	7	504
Plant Pathology Dept. ..	38	267	55	360
Soils Chemistry Dept.	18	116	31	165
Rubber Chemistry Dept. ..	174	37	122	333
Statistical Section	—	24	9	33
Estates Advisory Dept. ..	352	—	26	378

Summary of Departmental Work

Botany Department :

While general advisory work fell within the purview of the newly-formed Estates Advisory Department, special problems related to planting, tapping and yield stimulation continued to be attended to by this Department.

Owing to the unavailability of suitable clonal materials at the Institute's estates, investigations on yield stimulation have been limited. Once again we appeal to estates to offer us 10-acre or larger blocks in which to carry out trials. Results of a small-scale experiment at Dartonfield confirm the findings elsewhere that the response to stimulation of virgin bark is poor. A small-scale experiment commenced in August, 1966 on clone Tjir 1 has so far shown that the yield response to application of RRIC Mixture I was better than to injection of copper sulphate.

Clone RRIC 45 continues to perform well in our yield trials. It is a vigorous grower and although a few clones may outyield RRIC 45, it offers a satisfactory combination of yield and growth as well as relative freedom from leaf and panel diseases. In trial plots under dry climatic conditions in the Kurunegala and Moneragala Districts, it has maintained its growth, vigour and relative freedom from leaf diseases. In the wet districts this clone should yield around 500 lb per acre in the first year of tapping and exceed 1,000 lb per acre in the 4th year of tapping. Among the RRIC clones under test, 86, 88, 89, 90 and 91 are performing well and at least one of these clones is expected to yield over 2,000 lb per acre at maturity. RRIC 36 is a very high yielder with a predicted yield of over 3,000 lb per acre but owing to its extreme susceptibility to Bark Rot, should be suitable only for the drier districts.

A programme for the setting down of yield trials of the more promising clones on commercial estates was initiated in 1964. These yield trials are designed to assess the comparative performance of clones as well as to test their suitability for planting in the different districts in Ceylon. So far trials have been successfully set down at Hanwella, Matugama, Deraniyagala, Nivitigala, Yatiyantota, Kegalle, Matale and Moneragala. We await offers from estates in other planting districts to enable us to expand our clone evaluation trials.

Genetics and Plant Breeding Department :

A method for the rapid determination of the latex content of *Hevea* tissues as a possible means of assessing the potentialities of newly-bred varieties at an early stage in growth was evolved.

Hand pollination programmes were carried out on a wider range of material than in previous years and with a reasonable degree of success.

Twenty clones of hand-pollinated origin were selected for successful tapping at 4½ years of age at Kuruwita. These were especially bred for favourable secondary characters including vigour, to enable early exploitation. Girth measurements taken after one year's tapping at 67% intensity confirmed that although the trees were brought into tapping at this early age, there was no appreciable set-back to growth. Most of these selected clones also showed high yields.

Favourable **yield indices** in the Kalutara District were noted for clones previously found tolerant to *Oidium* at higher elevations in the Matale District.

Plant Pathology Department :

The incidence of *Oidium* leaf disease was the lowest on record for a number of years. Some *Oidium* spores became available in April which enabled further studies on germination. It was observed that direct sunlight and ultra-violet light are not quite as lethal to the conidia of *Oidium heveae* as to the zoospores of *Phytophthora meadii*.

Studies on the growth of *Phytophthora* on media of known composition were continued with the assessment of the requirements of this fungus for nitrogen and vitamins. It has been found that Vitamin B_1 is essential for *Phytophthora meadii* to grow profusely on basic synthetic media. Studies on physiologic specialization of this fungus, have shown that there are at least 5 races of this fungus in Ceylon. In investigations on the epidemiology of *Phytophthora* leaf disease, critical studies have shown that pods become infected readily in the presence of little innoculum and that leaves are generally infected by the innoculum splashed from infected sporulating pods. It was also found that sporangia can be produced on pods for periods of up to 14 days from first sporulation.

The effect of temperature and relative humidity on the sporulation of *Gloeosporium alborubrum* on immature rubber leaves were studied to establish the correlation between weather and the incidence and spread of this disease. *Gloeosporium alborubrum* was found to sporulate most profusely at high humidity and relatively low temperatures. Laboratory studies on clonal susceptibility to *Gloeosporium* leaf disease have confirmed that PB 86 is the most susceptible while RRIC 45, 52 and 86, as well as GL 1, Mil 3/2 and Wagga 6278 are the most tolerant to *Gloeosporium* leaf disease.

Two new fungicides ' Cerano N ' and ' Pantox ' were tested for their efficiency as panel fungicides. The former was found to be toxic to *P. meadii* as well as the bark of the rubber tree while the latter proved to be non-toxic to *P. meadii*. Histological studies of Bark Rot-infected tissue revealed that fungal hyphae are almost exclusively intracellular and could readily pass through cell walls.

Pot experiments have confirmed that sulphur is effective in suppressing the incidence of *Fomes* when introduced to the soil. It appears that the mode of action of sulphur in the soil is that it suppresses the growth of all fungi other than *Trichoderma viride* and this fungus suppresses the growth of *F. lignosus*. Studies on the distribution of fungi in rubber-growing soils were continued and the fungi associated with healthy and *Fomes*-infected rubber roots are being studied.

Soils Chemistry Department :

Results obtained from field trials now provide sufficient experimental evidence to indicate that application of NPK fertilizers at rates presently recommended by the Institute for clonal rubber during the immature as well as the early productive phase would result in increased yields that would economically be worthwhile even under conditions of an assumed unfavourable cost-price situation.

There is now definite evidence that direct beneficial response to fertilizer application in the mature phase can be obtained only from rubber which has received balanced nutrition in NPK form during the juvenile phase.

A trial laid down in 1963 to determine whether the more vigorous clones that have been recommended for large-scale planting in recent years such as RRIC 45 and 52 would benefit from higher levels of fertilizer applications indicates that application of an NPK + Mg fertilizer mixture at higher rates than presently recommended in our standard mixtures will not increase the rate of growth of the more vigorous materials any more than that of the control PB 86.

In an experiment laid down to study the effect of reduced levels of N, P and K on the incidence of wind damage, there was no significant difference in wind losses due to treatment differences.

The two new herbicides, Tordon 22K and Tordon 101, tested for effectiveness in eradicating ferns such as Bracken and Nephrolepis and other pernicious weeds such as Illuk, Lantana and rogue rubber seedlings, have been found to be more effective than herbicides that have been tested in the past. This was found to be so even at the rate of 1·5 lb per 30 gallons of water.

The rubber-growing areas covered by the 1" topo sheets and covering a total area of about 2,300 sq. miles have now been soil-surveyed at a semi-detailed reconnaissance level.

Instances of an unusual form of necrosis encountered in young replantings have been diagnosed as either boron toxicity and/or calcium deficiency. Since the remedial measure for boron toxicity as well as calcium deficiency is the application of lime and since no dolomite had been applied in all instances where the symptoms were observed, application of dolomite was recommended as the remedial measure.

In a trial set down on clone PB 86, to evaluate the response to application of fertilizers from the time of planting as estimated by foliar analysis when compared with the response to application of standard NPK + Mg fertilizer mixture, an increased girth of 0·5" per tree was recorded in the foliar analysis treatment. This is not statistically significant yet worthy of note as this response was recorded with lesser expenditure on fertilizers.

Pelletized compounded fertilizers are in common use in most western countries. In a preliminary trial set down to evaluate the response of 3 granular compounded fertilizers against the standard NPK mixture, the treatments receiving the 3 brands of granulated compound fertilizers continued to show an additional girth of 1" per tree. Although the response was significant it should be borne in mind that the treatments are not strictly comparable in that the NPK proportions were not exactly the same in all 4 cases.

Rubber Chemistry Department :

The Rubber Research Institute in collaboration with Lever Brothers (Ceylon) Ltd. carried out an exercise to evaluate the economics of collection and processing

of rubber seed. About nine commercial estates participated in this experimental project. This experiment will be continued in 1967 and if the project proves workable may result in a foreign exchange saving of over 5 million rupees.

Assistance was given to the P.W.D. in the addition of latex to bitumen in road surfacings. Assistance was also given to Nakiadeniya Group, Nakiadeniya, to carry out dirt content and volatile matter content determinations.

Samples of scrap from Ceylon Trading Co., Colombo are being regularly tested for conformity to technical specifications and with a view to improving these grades.

Experiments were carried out to detect the substance which is responsible for the natural resistance of some clones to Bark Rot and Bark Cracking. Preliminary experiments indicate that clones susceptible to Bark Rot may contain low concentrations of tannins and those resistant, higher concentrations.

Experiments were continued to determine the factors which affect the Plasticity Retention Index of natural rubber.

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.

With the new research findings at the Natural Rubber Producers' Research Association in England that oil-extended natural rubber (OENR) is in no way inferior to oil-extended styrene butadiene rubber (OESBR) in passenger car tyre treads, preliminary experiments were initiated locally with a view to producing oil-extended rubber sheets on a commercial basis for use in tyre retreads.

Estates Advisory Department :

A new department for extension work designated the Estates Advisory Department came into operation with effect from January, 1966. Already there is an encouraging response particularly from the small and medium size estates which had not been catered for previously.

Statistical Section :

The Statistical Section continued to serve the research departments mainly in their designs, statistical analyses and in the interpretation of field experimental results.

Smallholdings Department :

The Smallholdings Department provides small owners with an efficient advisory service. As in previous years assistance to smallholders was in the form of general advisory visits, lining for planting holes and soil conservation works, organisation of sulphur dusting groups, advice on the construction of approved type-plan smoke houses and the marking of trees for correct tapping.

A publicity unit to disseminate information to smallholders using visual aids was in operation throughout the year.

A "crash programme" was initiated to step up the standard of manufacture of smallholders' sheet. The percentage of RSS 1 produced by small owners has generally been very low as compared with bigger estates. This is due to various difficulties which are specific to smallholdings. Nevertheless, it is essential from the stand

point of the national economy to improve the quality of sheet produced by small owners. Already as a result of this drive, an increase in the output of RSS 1 as well as an improvement in the general standard of sheet rubber manufacture has been noticed.

Estate Department :

Dartonfield Group comprising 1,491 acres in extent consisting of the 3 estates, Hedigalla, Nivitigalakelle and Dartonfield, has 988 acres in rubber. This acreage consists of experimental areas as well as research blocks which have now been released for commercial exploitation. The 57-acre block at Hedigalla which supplied clonal material to the Rubber Replanting Subsidy Scheme was converted to a budwood nursery at the end of the year.

The Kuruwita Sub-station of the Institute situated in the Ratnapura District has a total acreage of 247½ acres. A further 10 acres have been uprooted and cleared for replanting in 1967. Hence only 20 acres of the original polyclonal rubber remain for replanting in 1968 and 1969.

Publications Record 1966

General :

Annual Review for 1965.
Annual Report of the Rubber Research Board for 1965 — Part I (in press).
Annual Report of the Rubber Research Board for 1964—Part II (English).
Annual Report of the Smallholdings Department for 1965—Sinhala.
Rubber Research Institute of Ceylon, 1st & 2nd Quarterly Journals, **42** ; Parts 1 & 2, 1966.
Rubber Research Institute of Ceylon, 3rd & 4th Quarterly Journals, **42** ; Parts 3 & 4, 1966.
R.R.I.C. Bulletin (New Series) Vol. 1, No. 1.
R.R.I.C. Bulletin (New Series) Vol. 1, No. 2.
Advisory Circular No. 75 on " Yield Stimulation and Stimulants."
Advisory Circulars Nos. 12, 57, 66 and 73 were reprinted.
Smallholdings Folder No. 11 on " Manufacture of Smoked Rubber Sheet."

Roneoed Leaflets :

R.R.I.C. *Oidium* Questionnaire dated 7-2-1966.
Circular letter to Agency Houses dated 21-4-1966 *re* Visitors' Day.
Circular letter to Agency Houses dated 23-3-1966 *re* Data on Performance of the Newer Clones.
R.R.I.C. *Gloeosporium* Questionnaire dated 19-5-1966.
R.R.I.C. *Phytophthora* Questionnaire dated 14-5-1966.
Circular letter to Agency Houses dated 23-6-1966 *re* Survey of Wind Damage Losses.
Circular letter to Agency Houses dated 22-10-1966 *re* Exchange of Clones.

Papers :

Chandrasekera, L. B. Recommended planting material — 1966. *R.R.I.C. Bulletin* (New Series) **1**, No. 1 ; 1966 ; 5-7.

Fernando, D. M. Problems of achieving agricultural production potentials — Rubber. (Read at the C.A.A.S. sessions — December, 1966).

FERNANDO, D. M. A rapid method for estimating the rubber content of *Hevea* tissues. (Read at the C.A.A.S. sessions — December, 1966).

FERNANDO, D. M. An outline of the breeding, selection and propagation of rubber. *Rubb. Res. Inst. Ceylon Quart. J.* **42** ; 1966 ; 9-12.

PEIRIS, H. H. Manufacture of smoked rubber sheet. *R.R.I.C. Bulletin* (New Series) **1**, No. 1 ; 1966 ; 7-10.

PERIES, O. S. The nomenclature of the *Phytophthora* spp. causing bark, leaf, pod and twig diseases of the rubber tree in Ceylon. *Rubb. Res. Inst. Ceylon Quart. J.* **42** ; 1966 ; 1-8.

PERIES, O. S. Present status and methods of control of leaf and panel diseases of *Hevea* in South East Asian and African countries. *Rubb. Res. Inst. Ceylon Quart. J.* **42** ; 1966 ; 35-47.

PERIES, O. S. The economics of disease control in *Hevea*. *R.R.I.C. Bulletin* (New Series) **1**, No. 2 ; 1966 ; 27-33.

PERIES, O. S. and DANTANARAYANA, D. M. The distribution of different sexual compatibility types of *Phytophthora* species affecting *Hevea* in Ceylon. *Rubb. Res. Inst. Ceylon Quart. J.* **42** ; 1966 ; 29-33.

PERIES, O. S. and DAYARATNE, W. C. Studies on copper fungicides. I. Biological efficacy of copper spray deposits containing various 'stickers.' *Rubb. Res. Inst. Ceylon Quart. J.* **42** ; 1966 ; 53-56.

SIVABALASUNDERAM, J. and NADARAJAH, M. Factors affecting the Plasticity Retention Index of natural rubber. *Rubb. Res. Inst. Ceylon Quart. J.* **42** ; 1966 ; 13-28.

WIJEWANTHA, R. T. Yield stimulation and stimulants. *R.R.I.C. Bulletin* (New Series) **1**, No. 1 ; 1966 ; 2-4.

REVIEW OF THE BOTANY DEPARTMENT

By

L. B. CHANDRASEKERA

SUMMARY

Advisory

Advisory work involving special problems pertaining to planting, tapping and yield stimulation were attended to by the Botany Department.

Field Stimulation Experiments

The following yield stimulation experiments were in progress during the period under review.

Yield Experiment No. 1 — Long-term yield stimulation experiment in clone LCB 1320. RRIC Mixture I was applied twice a year on bark of first renewal.

During 1966 the stimulated tapping tasks recorded an average yield of 12·7 lb per tapper as compared with 10·2 lb per tapper for the unstimulated tasks.

Field Experiment No. 2 — During the 12-month period from December 1965 to November 1966, the 3 tapping tasks that were tapped on S/2, d/3, 67% with stimulation twice a year had yielded 5,095 lb with an average yield of 18·5 lb per tapper per tapping as compared with a total of 4,159 lb and an average of 10·1 lb per tapper per tapping for the 3 tasks tapped on S/2, d/2, 100% system without stimulation.

Field Experiment No. 35 — Small-scale Yield Stimulation Experiment — In this experiment the yield response to RRIC Mixture I had been better than for injection of copper sulphate pellets into the stock.

Field Experiment No. 4 — During the first 3 years of this experiment there had been no significant response to application of stimulants on virgin bark.

Tapping Experiments

Field Experiment No. 4 — During the first 3 years of this experiment there had been no significant difference in yield or rate of girthing between plots tapped with and without a rest during the wintering period.

Clone Evaluation Trials

The clone RRIC 45, although not among the highest yielders, offers the best combination of yield, growth and relative freedom from leaf and panel diseases. In trial plots under dry climatic conditions in Kurunegala and Moneragala Districts, the clone RRIC 45 has maintained its growth, vigour and relative freedom from leaf diseases.

The yields of clones RRIC 5, 7, 41, 86, 88, 89, 90 and 91 continue to be promising. These clones have been included in further trials in the different planting districts of Ceylon.

The clone RRIC 36 which had maintained high yields in the experimental areas as well as in a few estates should be suitable for the drier districts where climatic conditions are not conducive to the development of Bark Rot.

The clone RRIM 623 continues to maintain high yields in an experimental area in the Kalutara District. There are indications, however, that this clone could be subject to wind damage, particularly branch breakage, especially when subject to strong winds.

The early yields of clones TR 1406, AVROS 427 and AVROS 1734 would justify their planting on a trial scale in commercial estates.

Detailed Review

General

Staff :

Mr. L. B. Chandrasekera, Botanist was appointed Acting Head of Botany Department with effect from 7-3-1966.

Dr. R. Satchuthananthavale, Asst. Botanist resumed duties on 27-11-1966 after successfully completing his post-graduate studies at the University of Sheffield.

Miss A. C. I. Yahampath was appointed Assistant Botanist on 15-10-1966.

Publications :

1. Annual Review of Botany Department — 1965.
2. Advisory Circular No. 75 — Yield Stimulation and Stimulants.
3. Advisory Circular No. 77 — Cover Crops.
4. Recommended Planting Material — 1966. RRIC Bull. Vol. 1, No. 1, pp. 5-7.

Advisory Work

With the setting up of the Estates Advisory Department in 1966, there had been a considerable reduction in routine advisory visits and correspondence. However, certain special problems on planting and tapping continue to be handled by the Botany Department.

Yield Stimulation Experiments

Field Experiment No. 1 — Long-term Yield Stimulation — Clone LCB 1320

This experiment is designed to study the long-term effects of yield stimulation on bark of first renewal. The RRIC Mixture I is being applied to a $1\frac{1}{2}$ inch strip of scraped bark below the tapping cut at 6 months intervals. The first application was made in August, 1965.

The experiment consists of 6 tapping tasks, three of which are stimulated. Three unstimulated tapping tasks serve as controls.

The average yields recorded for the period December, 1965 to November, 1966 are presented in Table I.

TABLE I

LONG-TERM YIELD STIMULATION EXPERIMENT

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 :		
August 1965— November, 1965	11·3	10·3
December, 1965 — November, 1966	12·7	10·2

During the 12 months under review, the stimulated blocks have recorded an average increase of 2·5 lb per tapper per tapping above that of the unstimulated blocks.

Field Experiment No. 2 — Yield Stimulation and Tapping— Clone Tjir 16

This experiment was initiated in September, 1965 in an estate in the Matale District to compare the effects of two treatments on (*a*) yield per tapper (*b*) Total annual yield. The treatments are as follows :—

1. Tapped S/2, d/3, 67% and stimulated at 6 months intervals.

2. Tapped S/2, d/2, 100% but not stimulated.

Each treatment is applied to 3 tapping tasks. In the stimulated blocks RRIC Mixture I is applied to a 1½ inch strip of scraped bark below the tapping cuts.

Before application of treatments, all blocks were test-tapped for a period of 3 months on the S/2, d/2, 100% system. During this period the yield per tapper per tapping averaged 7 lb for the two sets of blocks.

The experimental yields were recorded daily by the estate concerned on the basis of yield per tapper.

The yield data for the period from December, 1965 to November, 1966 are presented in Table II.

TABLE II
Yield in lb dry rubber
December, 1965 — November, 1966

	Stimulated and tapped on S/2, d/3, 67%	Unstimulated and tapped on S/2, d/2, 100%
Average yield per tapper	18·5	10·1
Total yield for 3 tapping tasks	5,095·0	4,159·0

During the period under review the 3 tapping tasks tapped on S/2, d/3, 67% system and stimulated had recorded an increased intake per tapper as well as a higher overall yield than the unstimulated area tapped on the standard S/2, d/2, 100% system.

Field Experiment No. 35 — Small-scale Yield Stimulation Experiment

Owing to considerable interest shown by estates in Ceylon on the possible use of copper sulphate as a yield stimulant a small-scale experiment involving the injection of copper sulphate was set down in August, 1966. The treatments in this experiment are as follows :—

(1) RRIC Mixture I applied to a 1½ inch strip of scraped bark below the tapping cut.

(2) Treatment 1 combined with injection of copper sulphate pellets into the stock.

(3) Injection of copper sulphate pellets into the stock.

(4) Control (untreated).

Each treatment was applied to 5 trees of clone Tjir 1, that is being tapped on bark of 1st renewal on the S/2, d/2, 100% system.

The yields were recorded daily from the time of application of treatments. The average yields recorded for the period August to December, 1966 are presented in Table III.

TABLE III

SMALL-SCALE YIELD STIMULATION EXPERIMENT — NIVITIGALAKELE

Yield in grammes per tree per tapping

August to December, 1966

Treatment	A	B	C	D
Yield before treatment	34·3	33·4	38·2	43·5
Adjusted yield after treatment	73·0	65·1	58·5	43·2

A — RRIC Mixture I

B — RRIC Mixture I + copper sulphate

C — Copper sulphate

D — Control

In this experiment the best yield response is recorded for the RRIC Mixture I applied below the tapping cut.

Owing to the lack of suitable clonal material at the Institute's experimental areas, investigations on various aspects of yield stimulation had necessarily to be curtailed during the period under review. The Botany Department therefore solicits the assistance of commercial estates in order to implement its programme of work on yield stimulation.

TAPPING EXPERIMENTS

Field Experiment No. 3 — 1954 Tapping Experiment — Dartonfield

Two plots of 5 trees each of 18 clones were initially tapped at heights of 42 inches and 50 inches respectively from the graft union. The yield and girth figures representing the averages for each plot of 5 trees are presented in Table IV.

TABLE IV

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	Virgin bark thickness in mm	Girth in inches at 5 ft.	Yield
RRIC 8	6·4	27·2	22·5	7·0	28·1	22·7
,, 16	8·0	28·4	24·0	8·2	32·5	26·6
,, 17	7·8	28·8	23·3	8·0	30·5	28·3
,, 18	8·0	27·0	22·7	7·8	28·1	22·3
,, 19	5·8	23·8	16·8	6·6	21·9	15·6
,, 20	7·0	25·5	27·8	6·6	26·4	29·4
,, 21	5·6	26·4	21·2	6·8	28·4	19·8
,, 22	8·0	29·0	34·9	8·0	28·1	26·5
,, 23	7·4	24·1	18·9	7·5	26·2	21·3
,, 24	7·4	32·6	24·5	7·4	34·0	28·0
,, 25	7·0	24·8	13·8	6·0	25·2	13·8
,, 26	8·0	24·9	22·8	7·6	27·3	21·6
,, 27	8·0	20·3	7·4	8·0	21·3	9·6
,, 28	7·5	26·6	28·3	8·2	29·3	34·4
,, 30	8·0	23·9	24·3	9·5	27·8	19·9
,, 31	6·1	27·0	24·3	7·5	20·9	34·9
,, 32	7·0	22·4	21·6	7·4	22·8	24·3
,, 33	6·4	23·6	20·0	7·2	25·5	30·8
,, 34	8·6	22·6	25·0	10·2	25·2	29·1
,, 35	9·5	26·4	35·8	7·5	24·7	29·8
,, 36	10·0	32·1	45·5	10·0	30·1	48·8
,, 37	7·4	22·0	20·5	10·0	32·1	38·7
,, 54	8·0	30·0	33·1	8·2	30·3	43·2
,, 57	7·6	26·0	35·4	8·5	27·3	33·3
PBT 207	9·0	29·4	38·5	9·0	28·5	27·1
PB 28/59	9·2	24·8	42·9	8·7	25·8	54·1
,, 24/51	6·5	23·2	18·4	7·0	22·4	20·3
,, 24/3	7·6	24·8	24·3	7·3	26·2	29·9
Mean	7·6	26·0	25·7	7·9	27·3	28·0

The difference in yield for the two heights of tapping had not been significant. This experiment will be discontinued from 1967.

Field Experiment No. 4 — 1964 Winter Tapping-cum-Yield Stimulation Trial

A small-scale experiment was initiated in 1964 in order to test the effects of yield stimulation on virgin bark at 6-monthly intervals combined with tapping with and without a rest during the wintering period. Each treatment is applied to 20 trees from each of the clones Nab 12 and PB 86 and replicated 3 times.

The girth and yield data for the first 3 years are presented in Table V.

TABLE V

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
Average girth in ins. (1966)	29·0	29·9	28·8	28·9
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
Average adjusted yield (1966)	39·0	39·5	43·2	35·0
(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
Average girth in ins. (1966)	28·5	28·8	28·7	29·9
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
Average adjusted yield (1966)	37·4	36·2	37·5	37·7

*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.

The rate of girthing as well as yield response to various treatments had not been significant.

Clone Evaluation Trials

Field Experiment No. 5 — Large-scale Clone Trial — 1946 Replanted Area — Nivitigalakele

RRIC 88 and 89.

Test-tapping results for 1966 are presented in Table VI.

Table VI

Large-scale Clone Trial — 1946 Replanted Area — Nivitigalakele

Yield in lb dry rubber per tree per year

	RRIC 88	RRIC 89
No. of trees tapped in 1966	22—21	22—19
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
,, 1966	26·6	23·9
Brown Bast cases in 1966	3	5
Canker and Bark Rot cases, 1966	—	1
Wind damage cases	1	—
Girth in inches in 1966	39·7	37·7
Bark measurements, 1966 in mm — Virgin	12·5	11·4
Renewed	10·1	9·1

The incidence of leaf and panel diseases in the two clones RRIC 88 and 89 had so far been negligible.

Field Experiment No. 6 — 1952 Small-scale Clone Trial — Hedigalla RRIC 90 — 95

625, five-tree clones established from a selection of the 1945 hand pollinated seedlings were planted in the trial. Of these, 6 clones were finally selected for yields and good secondary characters. Test-tapping results of these clones are presented in Table VII.

TABLE VII

1952 CLEARING — HEDIGALLA

Tapped on S/2, d/2, 100% from July 1960
Yield in lb dry rubber per tree per year

Clone	No. of trees tapped 1966	YIELD						Girth in inches 1966	Bark thickness in mm	
		1961	1962	1963	1964	1965	1966		Virgin bark	Renewed bark
RRIC 91	5	22·9	25·3	22·3	25·3	24·6	36·5	39·0	10·2	9·2
,, 90	5	20·5	21·1	26·0	26·5	26·4	31·4	32·8	10·3	8·0 (1BB)
,, 93	3	15·8	18·2	23·9	21·9	17·1	22·6	28·1	10·1	8·8 (3BB)
,, 94	3	15·6	17·7	19·6	18·2	17·1	20·8	26·4	8·8	7·2 (2BB)
,, 92	5	16·7	15·5	15·8	16·6	17·1	16·9	32·3	8·4	8·1 (1BB)
,, 95	5	14·5	15·6	13·3	19·1	14·1	15·9	37·4	9·7	7·6

The two most promising clones RRIC 90 and 91 are under test in large-scale trials.

Field Experiment No. 7— 1954 Clone Trial — Nivitigalakele

Test-tapping results for 1966 are presented in Table VIII.

TABLE VIII

1954 CLONE TRIAL — NIVITIGALAKELE

Tapped on 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
,, ,, 1966	10·2	13·1	13·1	10·7	12·2	19·5	12·9	13·9
No. of trees tapped in 1966	102–76	154–132	80–57	151–137	141–122	138–125	162–159	140–112
Canker and Bark Rot cases	3	3	5	2	4	3	1	4
Brown Bast cases	20	18	21	28	26	22	9	16
Wind damage cases	95	35	112	17	34	33	9	60
Total casualties to date	118	56	138	47	64	58	19	80
Mean girth in inches	24·4	28·5	26·1	24·9	27·4	28·5	27·8	26·5
Virgin bark thickness in mm	7·6	9·2	9·6	8·9	9·3	10·2	8·7	9·4

Field Experiment No. 8 — 1944 Small-scale Clone Trial — Hedigalla

Test-tapping was discontinued in 1966 as this area was due for replanting in early 1967.

Field Experiment No. 9 — 1950 Clone Trial — Hedigalla

Test-tapping results are presented in Table IX.

TABLE IX
CHEMARA CLONE TRIAL — HEDIGALLA
Tapped S/2, d/3, 67% from March 1957
Tapped S/2, d/3, 100% from 1960

	Ch 26	Ch 3	PB 86 (control)
Yield in 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
,, ,, 1966	18·4	17·9	20·2
No. of trees tapped in 1966	33–29	37	64–63
Bark Rot and Canker cases	–	–	–
Brown Bast cases	2	–	1
Wind damage cases	2	–	–

Field Experiment No. 10 — 1945 Clone Trial — Hedigalla

Test-tapping results of clones RRIC 4, 5 and 7 are presented in Table X.

TABLE X

1945 CLONE TRIAL — HEDIGALLA

Tapped on 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 in 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
,, ,, 1966	8·6	15·8	16·9	10·7
No. of trees tapped in 1966	37–22	55–50	71–67	64
Girth in inches 1966	31·7	36·6	35·9	32·8
Brown Bast cases	15	5	3	—
Wind damage cases (blown down)	—	—	1	—

The clones RRIC 5 and 7 are now recommended for small-scale planting in estates.

Field Experiment No. 11 — 1950/51 Clone Trial — Hedigalla

The test-tapping results of final selections in this trial 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 in 1966	Brown Bast cases	Bark Rot cases	Wind damage cases
	1961	1962	1963	1964	1965	1966				
RRIC 99	14·2	19·4	17·7	20·4	17·9	18·2	63–56	7	—	—
(RR 134) RR 108	15·2	15·9	12·7	15·3	13·7	13·7	56–55	1	—	—
RR 116	10·5	10·8	14·5	13·7	13·1	14·8	63–59	4	—	—
PB 86	13·3	16·3	15·9	17·0	16·9	17·7	61–59	2	—	—

Field Experiment No. 12 — 1949 Clone Trial — Hedigalla

The clones are planted in 25-tree plots replicated six times. Test-tapping results of the more promising selections are presented in Table XII.

TABLE XII
1946 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 in 1966	Yield					Girth in inches	Percentage of casualties upto 1966
		1962	1963	1964	1965	1966		
RR 29	107–106	16·9	16·7	20·2	22·7	20·1	32·0	28
RRIC 86	75–71	21·0	19·3	20·9	22·0	19·8	30·4	51
PB 86	102–98	15·6	15·7	18·1	20·9	16·9	32·4	33
RRIM 501	75	17·7	13·8	18·2	17·9	15·6	26·2	50
RRIC 52	101–100	15·6	14·9	17·4	17·4	14·7	39·2	33
Dar. 38	98–95	11·6	12·5	16·5	16·2	13·2	31·8	35
RRIC 87	112	13·6	12·6	13·5	14·7	12·1	34·7	25
RRIM 513	111–110	13·4	11·6	13·0	12·8	10·9	26·6	27

The clone RRIC 86 has good secondary characters and has been yielding better than the control clone PB 86. This clone is being tested further in large-scale trials.

Field Experiment No. 13 — 1954 Clone Trial — Hedigalla

Clones in this trial are planted as monoclonal blocks of 800 to 1000 trees per clone. Tapping commenced as individual clones reached tappable girth as follows :—

First tapped in 1961 — RRIC 16, 18, 22, 26, 35, 36 and RRIM 501.

„ „ „ 1962 — RRIC 19, 21, 24, 25, 28, 29, 31, 34, 37 and AVROS 255.

„ „ „ 1963 — RRIC 17, 23, 32, 33, PR 107 an PB 86.

„ „ „ 1964 — IRCI 10, NL 1 and one blotk of PR 107.

The 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 1966	Girth in inches 1966	Yield				
			1962	1963	1964	1965	1966
RRIC 36	491	27·0	33·0	44·1	41·8	37·9	41·8
,, 35	675–650	26·4	33·5	32·2	30·6	32·5	39·5
PB 86	561–551	24·7	—	32·9	31·0	28·0	37·2
RRIC 22	690–605	27·6	25·1	21·7	26·8	27·9	36·9
,, 37	527–510	24·8	28·8	23·0	28·4	25·3	36·4
RRIM 501	626–584	24·7	28·2	39·6	39·7	42·9	34·7
RRIC 18	623–629	26·6	24·1	27·7	26·8	29·3	32·3
,, 30	420–418	22·6					32·2
,, 32	613–584	24·5	—	21·4	23·6	25·7	30·7
AVROS 255 'H' block	784–779	24·4	21·3	23·6	24·5	25·5	28·7
RRIC 28	521–506	25·2	32·0	29·5	28·6	27·3	28·1
,, 34	561–543	25·1	36·3	32·3	26·3	28·1	27·1
,, 33	533	23·5	—	34·3	24·9	21·4	27·1
,, 16	695–677	28·1	16·8	14·4	22·4	18·9	26·2
PR 107 'H' block	761–743	23·7	—	31·8	25·6	24·0	24·7
RRIC 19	566–569	26·0	16·0	18·5	25·3	23·5	24·3
,, 29	441–447	24·2	16·7	18·3	21·9	18·2	23·9
,, 17	631–612	23·9	—	21·7	19·7	17·9	23·8
,, 21	579–583	27·7	14·4	10·4	15·4	16·2	22·6
IRCI 10	603–609	21·2	—	—	17·6	19·2	22·6
RRIC 31	600–598	25·9	21·0	14·7	15·6	20·0	21·8
RRIC 24	653–685	28·4	10·7	10·9	14·2	12·9	20·9
RRIC 23	689–701	23·8	—	16·6	15·5	11·9	18·7
PR 107 'K'	111–110	21·3	—	—	10·3	15·5	18·7
RRIC 26	523–531	25·3	14·6	13·3	15·7	13·3	16·4
,, 20	456–420	21·0					15·7
,, 25	580–585	24·6	16·7	12·7	13·4	12·2	14·1
NL 1	64–67	24·7	—	—	17·4	16·1	14·1

Clones RRIC 36 and 37 are very susceptible to Bark Rot when planted in the wet districts.

Field Experiment No. 14 — 1955 Clone Trial — Hedigalla

Twelve RRIC clones are planted in monoclonal blocks of 750 trees per clone. Tapping commenced in June 1962.

The test-tapping 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 1966	Yield					Girth in ins. 1966	Bark Rot and Canker cases	Brown Bast cases	Wind damage	
		1962	1963	1964	1965	1966				Branch and Stem	Up-rooted
RRIC 50	477–468	17·7	33·2	38·4	40·3	59·5	24·9			9	
,, 46	421–258	31·1	36·0	36·2	45·8	55·9	23·5	159		4	
,, 13	617–601	30·3	33·1	34·8	45·5	48·3	24·1		7	5	
,, 41	579–557	30·3	31·3	35·0	40·1	46·2	24·9	6	4	12	
,, 40	516–488	28·5	32·4	42·0	45·4	46·2	26·8		8	16	(4 *Fomes*)
,, 12	532–478	15·2	18·9	24·1	32·3	36·8	28·1		22	32	
,, 11	495–484	21·6	24·8	27·4	25·6	30·9	25·7		6	9	
,, 9	587–578	19·5	21·4	22·6	29·6	30·3	27·0		2	3	(4 *Fomes*)
,, 47	590–573	20·3	27·0	26·2	32·1	30·0	23·3		16	1	
,, 43	580–559	25·4	23·7	23·0	25·5	27·2	23·7		2	19	
,, 49	496–482	23·1	20·0	20·1	15·0	26·2	25·0		5	9	
,, 14	617–593	21·3	17·2	19·8	22·5	26·0	26·2	15		9	
Mean		23·6	26·6	29·1	33·3	38·6	25·3				

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

Field Experiment No. 15 — 1953 Clone Trial — Nivitigalakele

There are approximately 700 trees each of clones RRIC 44 and 45 in this trial. They were tapped on S/2, d/2, 100% system from January, 1962.

The clone RRIC 44 was established from a RRIC 8 × Hil 28 cross and has inherited the broadly fluted tapping panel of Hil 28 which makes it unpopular for commercial planting.

The yield data for clones RRIC 44 and 45 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 tapping

	RRIC 45	RRIC 44
No. of trees tapped in 1966	603–551	575–546
Yield in 1962	8·9	10·8
,, ,, 1963	10·2	11·3
,, ,, 1964	10·6	11·7
,, ,, 1965	10·5	11·3
,, ,, 1966	11·0	11·0
Brown Bast cases	38	17
Bark Rot and Canker cases	2	9
Wind damage cases	34	23
Mean girth in inches, 1966	25·6	24·2
Thickness of virgin bark in mm	8·2	8·1

Clone RRIC 45 is a vigorous grower, has good secondary characters and show a high degree of resistance to leaf and panel diseases.

Field Experiment No. 16 — 1956 Clone Trial — Hedigalla

A selection of clones are planted in 300-tree monoclonal blocks in two sections. The clones RRIC 39, 42, 48, AVROS 1328, 1447, 1851, IRCI 1, 3, 6, TR 1406 and PR 256 were planted 4 months later than the other clones.

Tapping commenced as individual clones reached tappable girth as follows :—

First tapped in July 1963 — RRIC 55, PB 86, IRCI 5, 9, RRIM 603, 605, 612, 618, PR 228, 252, 257, AVROS 1191.

" " " March 1964 — RRIC 39, 48, 54, 59, PR 253, 258, RRIM 617, AVROS 1447.

" " " " 1965 — PR 247.

" " " " 1966 — TR 1406, RRIC 42, AVROS 1328 and 1851.

" " " Sept. 1966 — IRCI 1, 3, 6, PR 256.

The 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 1966	Average girth in inches	Yield		
			1964	1965	1966
RRIC 48	216–210	21·7	26·0	28·4	39·7
IRCI 9	229–221	24·7	23·7	31·7	38·8
AVROS 1447	163–185	23·1	17·3	22·8	35·2
RRIC 55	209–202	22·7	22·2	29·7	35·1
IRCI 5	242–247	21·8	19·6	23·1	33·7
PR 252	292–213	23·4	24·5	35·3	33·0
RRIC 39	216–222	22·2	21·7	25·3	30·7
PR 247	189–181	22·5	—	28·1	30·6
RRIM 618	235–232	23·1	29·7	26·0	30·1
PR 228	255–243	22·4	18·8	22·8	29·7
" 257	191–193	22·5	29·5	29·4	29·2
TR 1406*	138–186	20·0	—	—	28·8
PR 253	231–205	21·2	25·7	20·3	28·1
PB 86	253–240	25·6	20·6	23·1	28·1
PR 258	228–215	20·9	15·5	19·3	26·8
AVROS 1191	210–212	22·0	19·5	23·4	26·8
RRIM 617	240–232	23·8	20·3	24·3	25·6
RRIC 42*	239–244	22·9	—	—	25·4
" 54	252–228	22·1	15·8	23·6	24·7
" 59	220–198	22·4	15·9	19·2	24·2
AVROS 1328*	208–270	20·8	—	—	23·5
IRCI 1**	193–186	19·2	—	—	22·9
RRIM 605	220–230	22·8	14·7	15·7	22·4
IRCI 3**	194	18·4	—	—	21·8
RRIM 612	249–251	27·1	9·8	17·7	21·7
" 603	249–242	23·0	15·9	21·3	21·4
AVROS 1851*	184–249	23·4	—	—	21·2
PR 256**	136	17·1	—	—	20·8
IRCI 6**	138	18·9	—	—	16·5

*From March 1966.

**From Sept. 1966

Field Experiment No. 17 — 1956 Clone Trial — Dartonfield

Four clones GT 1, WR 101, AVROS 385 and AVROS 427 are planted in 300-tree monoclonal blocks. 48 points in the boundaries are planted with clone RRIC 52.

The clones GT 1, WR 101, AVROS 385 and AVROS 427 were first tapped in 1963. The clone RRIC 52 was tapped 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 1966	229–283	266–280	234–254	234–239	44–46
Yield in 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
,, ,, 1966	20·9	21·6	14·2	22·4	27·5

Field Experiment No. 43 — 1957 Clone Trial — Hedigalla

This trial was planted with 171 ten-tree clones established from hand pollinated seedlings. 24 ten-tree clones were established from crosses with clone LCB 870. Ten-tree plots of clone PB 86 were planted at intervals as control plots in the main trial area.

The two clones RRIC 51 and 64 were planted as 250-tree blocks of each clone with 200 trees of clone PB 86 to serve as a control.

132 points of clone Ch 26 were planted in a boundary area. Tapping commenced in April 1966.

The test-tapping results are presented in Table XVIII.

TABLE XVIII

1957 CLONE TRIAL — HEDIGALLA

Yield in grammes per tree per tapping

Clone	No. of trees tapped from April 1966	Yield 1966	Brown Bast cases
Ch 26	52–56	38·7	4
PB 86	65–148	30·1	1
1945 H.P.	110–140	27·2	4
RRIC 64	124–143	26·4	2
,, 51	7–45	23·2	
LCB 870 Kepitigalla crosses	141–170	20·6	
1954/55 H.P.	536–856	20·0	1

IMMATURE AREAS

Field Experiment No. 18 — 1961 Clone Trial — Dartonfield

This trial consists of large monoclonal blocks of approximately two tapping tasks per clone.

9½ acres are planted with clones RRIM 513, RRIC 7 and RRIC 52 at spacings of 12′ × 20′. 20½ acres are planted with clones RRIC 45, 88, 89, PB 86 and PB 28/59 spaced 8′ × 30′.

A summary of the girth measurements for the years 1963 — 1966 are presented in Table XIX.

TABLE XIX

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	1966	537	481	513	530	561	510	560	475
Average girth	1963	5·1	4·6	4·4	5·8	5·2	4·7	4·9	4·0
,, ,,	1964	8·4	7·6	7·7	9·2	7·7	8·3	7·3	6·1
,, ,,	1965	13·1	11·3	11·6	12·4	10·7	12·0	11·2	9·6
,, ,,	1966	18·2	15·4	15·9	15·7	13·6	16·7	14·3	13·2
Girth increase 1965/66		5·1	4·1	4·3	3·3	2·9*	4·7	3·1	3·6

* Planted in 1961 — N.E. season

** ,, ,, ,, — S.W. ,,

Field Experiment No. 19 — 1962 Large-scale Clone Trial — Nivitigalakele

The clones IAN 45–717, PB 86, RRIC 5, 39, 51, 86, 90, 91, 92, 93, 94, 95, 96, 97, RRIM 623, 628 and 701 are planted in 150-tree plots per clone.

Within a 150-tree plot the following clones are planted at approximately 10 trees per clone.

Clone Nos. 82, 566, 759, 815, 1009, 1103, 1317, 1458, Harbel 1, IAN 6497, PB 28/59, RRIC 7, 36, 45, 52, RRIM 607, 707.

The average girth figures are presented in Tables XX and XXI.

TABLE XX

1962 LARGE-SCALE CLONE TRIAL — NIVITIGALAKELE

Average girth in inches

Clone	No. of trees	Average girth		Girth increase 1965/66
		1965	1966	
RRIC 95	113	12·6	16·9	4·3
,, 91	129	12·9	16·8	3·9
,, 5	119	12·1	15·9	3·8
,, 39	127	11·0	15·5	4·5
RRIM 623	96	10·6	15·1	4·5
RRIC 86	128	11·3	15·0	3·7
RRIM 701	134	11·3	15·0	3·7
IAN 45–717	137	10·1	14·3	4·2
RRIC 96	134	10·6	14·3	3·7
,, 94	143	10·4	14·0	3·6
,, 93	137	10·2	13·9	3·7
,, 92	128	9·8	13·5	3·7
RRIM 628	128	9·3	13·4	4·1
PB 86	133	9·4	12·9	3·5
RRIC 51	134	8·9	12·6	3·7
,, 90	141	8·0	11·3	3·3
,, 97	144	7·5	11·0	3·5

TABLE XXI

1962 SMALL-SCALE CLONE TRIAL — NIVITIGALAKELE

Average girth in inches

Clone	No. of trees	Girth		Girth increase 1965/66
		1965	1966	
No. 82	8	13·2	18·3	5·1
PB 28/59	6	13·2	17·3	4·1
No. 1103	10	13·3	16·9	3·6
No. 1009	10	13·1	16·7	3·6
No. 1458	10	12·5	16·7	4·2
RRIC 52	8	12·4	16·6	4·2
No. 1317	10	11·8	16·3	4·5
No. 759	10	10·7	15·5	4·8
No. 815	9	11·5	15·3	3·8
RRIC 45	10	11·1	14·9	3·8
No. 566	10	10·5	14·6	4·1
RRIC 7	8	10·3	14·3	4·0
RRIM 707	9	9·3	13·8	4·5
RRIC 36	10	10·0	13·5	3·5
RRIM 607	8	8·5	12·9	4·4
IAN 6497	8	9·1	12·8	3·7
Harbel 1	9	8·9	11·9	3·0

Field Experiment No. 20 — 1963 Clone Trial — Nivitigalakele

The clones RRIC 6, 39, 41, 59, 60, 64, 75, 98 and PB 86 are planted as monoclonal blocks in May 1963.

The girth measurements of clones taken at 3 years of age are presented in Table XXII.

TABLE XXII
1963 LARGE-SCALE CLONE TRIAL — NIVITIGALAKELE
Average girth in inches

Clone	No. of trees	Girth (June 1966)
RRIC 98	139	9·8
,, 41	127	9·4
,, 6	138	7·4
,, 39	129	7·3
,, 60	277	7·2
,, 64	242	6·8
,, 75	193	6·7
,, 59	136	5·9
PB 86	211	6·3

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 in plots of 106 trees per clone replicated 3 times. This trial is expected to provide data on the comparative performance of the 4 clones.

Field Experiment No. 22 — 1965 Clearing — Nivitigalakele

10 acres were planted with clone RRIC 45 during the S.W. planting season in 1965. This area will be used for tapping experiments.

Field Experiment No. 23 — 1965 Small-scale Clone Trial — Dartonfield

The clones RRIC 5, 88, 89, 90, 91 and RRIM 600 were planted during the S.W. monsoon season in 1965. Owing to the very limited acreage that was available, each clone was planted in 50-tree plots replicated 3 times.

Field Experiment No. 24 — 1965 Spacing Trial — Kuruwita Sub-station

The 3 clones RRIC 41, 45 and 52 were planted at spacings of 8′×30′ and 12′×20′ for each clone. Each plot consists of 150 trees per clone replicated 3 times.

Field Experiment No. 34 — Small-scale Stock Experiment — Nivitigalakele

Approximately 102 seedlings from clones Tjir 1, RRIC 7, 41, 45, 52, 86, 88, 89 and *Hevea spruceana* were budded with clone PB 86 and planted at random during the 1966 S.W. planting season. This experiment was set down as a preliminary investigation on the possibility of using seed other than that of clone Tjir 1 as stocks. Owing to the limited acreage of the newer RRIC clones that had reached the seed bearing age only few seeds were available in 1965. More comprehensive trials will be initiated when more seeds become available.

At the end of 7 months from planting, scion growth was most vigorous where seedlings of clone RRIC 41 were used as stocks. There is a marked depression in growth of scions where *Hevea spruceana* seedlings were used as stocks.

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.

Test-tapping results for the first three years in tapping are presented in Table XXIII.

Table XXIII

1967 Small-scale Clone Trial — Estate A — Kalutara District

Yield in grammes per tree per tapping

Clone	Girth in inches						No. of trees tapped in 1966	Yield		
	1961	1962	1963	1964	1965	1966		1964*	1965	1966
IRCI 3	11·5	15·5	19·0	21·3	21·3	21·9	228–195	23·8	23·7	31·0
TR 1406	13·5	17·5	21·1	23·4	23·6	25·0	270–255	26·5	28·2	28·7
IRCI 2	12·5	16·8	20·6	23·0	22·5	23·6	271–245	21·0	27·1	26·8
RRIM 607	11·8	16·2	19·6	22·3	22·4	23·4	278–275	25·2	24·8	22·1
AVROS 529	12·0	15·6	19·3	21·8	21·7	23·2	296	16·7	19·0	20·4
PB 86	11·0	14·4	17·6	19·8	20·6	22·0	243–242	17·5	17·3	16·4
Mean	12·0	16·0	19·5	21·9	22·0	23·2	—	21·8	23·4	24·2

*Test-tapped from March 1964.

The clone TR 1406 appears to be promising. It has so far remained relatively and panel diseases.

Field Experiment No. 26 — 1957 Clone Trial — Estate B — Kalutara District

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

(*b*) 20 acres — Twelve clones are planted in monoclonal blocks of 300 trees per clone.

Both experimental areas were first tapped in April 1964. The yields are presented in Tables XXIV and XXV.

TABLE XXIV

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

Clone	Average girth in inches						No. of trees tapped in 1966	Yield		
	1961	1962	1963	1964	1965	1966		1964*	1965	1966
AVROS 1734	15·0	18·3	21·0	23·5	23·8	25·1	205	35·6	40·5	39·7
PR 254	14·3	17·5	20·5	22·6	22·7	24·1	255–254	19·0	19·6	28·4
RRIM 612	15·5	19·2	22·3	25·5	26·0	27·7	227	19·8	24·8	28·2
TR 1548	15·5	19·3	22·3	24·7	24·9	26·1	206–204	22·0	23·9	24·1
AVROS 2037	15·0	18·4	21·7	25·1	24·7	25·9	208–207	21·1	20·6	23·6
PB 86	13·3	16·3	18·9	20·8	21·7	22·9	199–198	23·9	23·6	29·1
Mean	14·8	18·1	21·1	23·7	24·0	25·3		23·6	25·5	28·8

*Test-tapped from April, 1964.

TABLE XXV

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

Clone	Average girth in inches						No. of trees tapped in 1966	Yield		
	1961	1962	1963	1964	1965	1966		1964*	1965	1966
RRIM 623	14·3	17·3	20·6	22·6	23·8	24·9	263–257	29·8	33·3	39·3
RRIC 61	13·8	16·5	19·1	21·1	21·5	23·0	227	19·9	23·3	33·5
WR 101	13·8	17·1	19·8	21·8	22·1	23·5	209	22·0	19·1	28·2
RRIC 76	14·0	17·4	19·9	22·0	22·2	23·5	265	17·8	20·4	27·2
,, 75	15·5	19·0	22·0	24·5	25·4	27·2	195–188	21·7	18·4	26·7
RRIM 603	14·0	16·8	20·0	22·5	23·0	24·8	214–213	19·6	19·1	25·9
,, 602	14·1	17·6	20·3	22·5	23·1	24·4	266	15·4	14·4	21·2
PR 248	12·5	15·8	18·9	22·2	22·5	24·3	228	17·2	18·0	20·1
RRIC 60	14·0	16·7	19·8	22·4	23·0	24·4	247	12·4	15·3	19·9
RRIM 622	14·0	17·0	19·9	21·7	21·9	23·1	218–215	21·3	19·1	19·6
TR 1542	13·8	16·5	19·2	20·5	21·1	22·6	230	16·8	15·7	19·2
PB 86 1							266			
PB 86 2	12·4	15·3	18·3	19·8	21·0	22·5	262–261	18·0	19·9	23·4
PB 86 3							241–235			
Mean	13·9	16·9	19·8	22·0	22·6	24·0		19·3	19·7	25·4

The yields of clone AVROS 1734 are very promising. There had been no major outbreaks of leaf and panel diseases. The latex is pale yellow in colour.

In the 20-acre trial, the clone RRIM 623 continues to be the highest yielder.

Field Experiment No. 27 — 1958 Clone Trial — Estate B — Kalutara District

All clones are planted in monoclonal blocks of 300 trees per clone. Tapping commenced in April 1965.

The test-tapping results for the first two years are presented in Table XXVI.

TABLE XXVI

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 in 1966	Yield	
	1961	1962	1963	1964	1965	1966		1965	1966
AVROS 427	9·3	12·8	15·8	18·5	18·8	20·2	237	29·6	37·1
RRIC 55	8·3	12·1	15·3	18·0	20·4	21·7	165–162	—	32·7
,, 36	8·8	13·5	17·2	20·4	21·5	23·8	213–212	24·1	27·9
RRIM 605	9·8	13·6	16·8	19·5	19·9	21·6	255	21·7	22·5
RRIC 45	10·2	14·2	17·7	19·8	20·7	22·0	265–261	17·1	22·1
WJ 1	8·5	12·2	15·4	18·6	20·1	22·0	205–204	17·7	21·9
IRCI 2	10·0	13·9	17·3	20·0	20·1	21·2	247	19·0	21·7
RRIC 37	10·0	14·0	17·5	20·2	20·4	21·5	209–208	16·3	20·2
,, 54	10·3	14·7	18·0	20·7	21·7	22·9	213–211	17·3	20·1
,, 39	8·0	14·9	18·9	22·1	22·7	24·2	222–220	20·4	19·9
,, 28	8·3	13·8	16·8	19·1	19·9	21·4	219–217	19·5	19·9
,, 22	10·0	14·2	17·6	20·8	21·5	23·2	268–267	17·4	19·7
RRIM 607	10·0	14·6	18·7	21·9	22·7	24·4	228	20·3	19·5
RRIC 41	11·0	14·8	18·0	21·1	21·9	23·5	269	18·2	19·5
IRCI 6	9·0	13·1	16·2	19·3	20·9	22·2	200–199	16·2	19·2
GT 1	10·1	13·8	17·4	20·3	20·8	22·3	289–286	13·3	16·6
RRIC 52	9·3	16·2	20·8	22·8	24·6	26·1	261–260	13·8	15·0
AVROS 385	9·3	13·5	16·6	19·7	21·0	23·5	259	11·1	11·6
PB 86 1							191–189		
,, 2							231		
,, 3	8·3	12·3	15·4	18·1	19·8	21·3	216	17·6	22·9
,, 4							208		
Mean	9·4	13·8	17·2	20·0	21·0	22·6		18·4	21·6

Clone AVROS 427 has been yielding well in this trial. No major outbreaks of leaf and panel diseases occurred in this clone until September 1966 when during the monsoon rains there was heavy *Phytophthora* leaf-fall.

The yields of clone RRIC 36 confirm the high yield potential of this clone. Owing to its extreme susceptibility to Bark Rot it would not be suitable for planting in the wet districts.

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

The test-tapping results of a selection of clones from a commercial plantation are presented in Table XXVII.

TABLE XXVII

CLONE TRIAL — COMMERCIAL ESTATES — KALUTARA DISTRICT — ESTATE C

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

Yield in grammes per tree per tapping

Clone	No. of trees tapped in 1966	Yield			Girth in inches 1966
		1964	1965	1966	
Division I	(1957 clearing)*				
RRIC 7	183	29·7	27·1	38·4	23·1
,, 36	189–184	31·9	34·5	36·6	23·5
IRCI 7	217–216	28·1	33·8	35·7	24·1
RRIC 37	188	28·4	28·8	30·5	21·7
,, 41	239	28·6	24·2	29·5	23·2
,, 45	268	23·6	24·5	29·5	22·4
,, 5	221	22·8	26·1	28·7	23·7
,, 52	236	18·5	22·1	23·5	26·1
Mean		26·5	27·6	31·6	23·5
Division II	(1958 clearing)**				
RRIC 41	245–250	22·7	21·0	26·2	22·2
,, 52	255–250	16·1	17·3	21·6	26·5
Mean		19·4	19·2	23·9	24·4

*First tapped in September 1963

**First tapped in January 1964.

Field Experiment No. 33 — 1962 Clone Trial — Estate D — Kalutara District

Four clones are planted in monoclonal blocks of 1800 trees per clone in May 1962. The girth measurements are presented in Table XXVIII.

TABLE XXVIII
1962 LARGE-SCALE CLONE TRIAL — ESTATE D — KALUTARA DISTRICT
Girth measurements

	RRIC 52		RRIC 45		RRIC 7		IRCI 7	
	ins.	inc-rease	ins.	inc-rease	ins.	inc-rease	ins.	inc-rease
1964 (Sept.)	7·1	—	4·9	—	3·6	—	5·4	—
1965 (Sept.)	10·0	2·9	8·0	3·1	5·8	2·2	9·1	3·7
1966 (Sept.)	14·9	4·9	11·1	3·1	8·0	2·2	13·0	3·9

YIELD TRIALS IN COMMERCIAL ESTATES

A programme for the setting down of yield-trials, of the most promising clones, in commercial estates was initiated in 1964. These yield trials are designed to assess the comparative performance of clones as well as to test their suitability for planting in the different districts in Ceylon.

The following yield trials have been set down during the period 1964 — 1966.

Field Experiment No. 29 — 1964 Yield Trial — 10 Acres — Salawa Estate, Hanwella

Clones RRIC 45, 86, 88 and Nab 15 are planted in 150-tree plots replicated 3 times.

Field Experiment No. 36 — 1966 Yield Trial — 10 Acres — Malaboda Estate, Matugama

Clones RRIC 45, 86, 88 and RRIM 701 planted at 135 trees per plot replicated 3 times.

Field Experiment No. 37 — 1966 Yield Trial — 10 Acres — Udapolla Group, Deraniyagala

Clones RRIC 5, 45, Nab 15 and RRIM 701 planted at 150 trees per plot replicated 3 times.

Field Experiment No. 38 — 1966 Yield Trial — 10 Acres — Kiribatgalla Group, Nivitigala

Clones RRIC 45, 88, 91 and AVROS 427 planted at 134 trees per plot replicated 3 times.

Field Experiment No. 39 — 1966 Yield Trial — 15 Acres — Halgolle Group, Yatiyantota

Clones RRIC 45, RRIM 605 and 701 planted at 250 trees per plot replicated 3 times.

Field Experiment No. 40 — 1966 Yield Trial — 10 Acres — Biddescar Group, Kegalla

Clones RRIC 36, 41, 45 and RRIM 605 planted at 150 trees per plot replicated 3 times.

Field Experiment No. 41 — 1966 Yield Trial — 20 Acres — Yatawatta State Plantation, Matale

Clones RRIC 36, 41, 86 and PB 86 planted at 265 trees per plot replicated 3 times.

Field Experiment No. 42 — 1966 Yield Trial — 34 Acres — Kumarawatta Group, Moneragala

Clones PB 86, RRIC 5, 45, 36 and 88 planted at 290 trees per plot replicated 4 times.

Inter-Cropping Trials

The following inter-cropping trials have been set down in order to investigate the possibility of interplanting rubber with subsidiary crops. In each case the choice of the subsidiary crop was left to the estate concerned.

Field Experiment No. 30 — 1964 Yield/Inter-cropping Trial — 15 Acres — Rosebury Estate, Koslanda

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 during the N.E. season in 1967.

Under the relatively dry climate that prevails in this district clone RRIC 45 has so far been the most vigorous grower. Growth as well as survival in dry weather after planting of clone PR 107 had been rather poor.

Field Experiment No. 31 — 1965 Yield/Inter-cropping Trial — 15 Acres — Redegama Estate, Rambodagalla

Clones RRIC 36, 45 and PB 86 are planted at 300 trees per plot replicated 3 times.

Half of each plot will be interplanted with cacao at a later stage.

Depending on the availability of land, it is proposed to extend inter-cropping trials to include other crops as well. Any estates interested in these trials are therefore kindly requested to communicate with this Institute.

The Botany Department wishes to thank Agency Houses, Estate Proprietors, Visiting Agents and Estate Superintendents for their assistance and co-operation in setting down field experiments in commercial estates.

List of 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 — Discontinued in 1966 for replanting
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 — Nivitigalakele
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, Koslanda
31. 1965 Yield/Inter-cropping Trial — Redegama Estate, Rambodagalla
32. 1953 Clone Trial — Hedigalla — (Closed)
33. 1962 Large-scale Clone Trial — Estate D — Kalutara District
34. 1966 Small-scale Stock Experiment — Nivitigalakele
35. Small-scale Yield Stimulation Experiment — Nivitigalakele
36. 1966 Yield Trial — 10 Acres — Malaboda Estate, Matugama
37. 1966 Yield Trial — 10 Acres — Udapolla Group, Deraniyagala
38. 1966 Yield Trial — 10 Acres — Kiribatgalla Group, Nivitigala
39. 1966 Yield Trial — 15 Acres — Halgolla Group, Yatiyantota
40. 1966 Yield Trial — 10 Acres — Biddescar Group, Kegalla
41. 1966 Yield Trial — 20 Acres — Yatawatta State Plantation, Matale
42. 1966 Yield Trial — 34 Acres — Kumarawatta Group, Moneragala
43. 1957 Clone Trial — Hedigalla

REVIEW OF THE GENETICS AND PLANT BREEDING DEPARTMENT

By

D. M. FERNANDO

SUMMARY

A rapid method was devised for the estimation of the latex content of *Hevea* tissues. Hand pollination programmes were carried out on a wider range than in previous years with a reasonable degree of success. Arrangements were finalized for larger-scale trial of experimental material on three commercial estates in addition to Institute plantings during 1967. Routine tapping was commenced at 67% intensity at $4\frac{1}{2}$ years of age on material bred for favourable secondary characters and planted in the 1961 clearing at Kuruwita : high yields without serious diminution of vigour of growth was recorded in this instance : in many cases the test clones were replicated in the clearing. The *Oidium*-tolerant clones at Kepitigalla showed satisfactory growth and yield : an early tapping test carried out on these clones in the wet low country plantings showed a high index of yield in addition to favourable growth.

DETAILED REVIEW

GENERAL

Staff

The Plant Breeding Section was overseen by Dr. R. T. Wijewantha in addition to his duties as Director during the earlier part of the year under review. On February 17th the Section was formed into a research division of Genetics and Plant Breeding and the Plant Breeder, Mr. D. M. Fernando was appointed Acting Head of the Division.

The Technical Assistant, Mr. P. Samaranayake, the Senior Field Assistant, Mr. H. B. H. de Silva, the Field Assistants, Messrs. D.S. Gamage, W. A. C. Wijesinghe and M. S. Senaratne and the Field Attendants, Messrs. W.D. Armon and D. S. Dedduwakumara were on duty throughout the year.

Buildings and Facilities

No progress was made in extending the buildings or providing a constant supply of electricity.

A Land-Rover was assigned to the Division from November.

Visits

The Acting Head of the Division made 32 visits in connection with experimental work during the year. 465 visits were made by the rest of the staff during the year in connection with experimental work.

Meetings

The writer attended the following meetings :—

C.A.A.S. Symposium on Rice Research — 5th April 1966.

The Sabaragamuwa District Planters' Association meeting held on 24th May 1966.

The Kalutara District Planters' Association meeting held on 11th June 1966 at which new clones and rubber seed oil were discussed.

The Kurunegala District Planters' Association meeting held on 20th July 1966.

The Kegalle District Planters' Association meeting held on 22nd July 1966 at which new experimental *Hevea* material was discussed.

C.A.A.S. sessions held on 17th and 18th December 1966 at which 2 papers were read.

Publications

The following publications were prepared by the staff of the Department :—

(i) Annual Review of the Plant Breeding Section for 1965.

(ii) A rapid method for estimating the rubber content of *Hevea* tissues (Read at the C.A.A.S. sessions December 1966).

(iii) Problems of achieving agricultural production potentials — Rubber — (C.A.A.S. sessions December 1966).

(iv) An outline of the Breeding, selection and propagation of rubber (*Rubb. Res. Inst. Ceylon Quart. J.* **42**, 9 — 12).

Laboratory Work

Routine examination was made of specimens from the different clone trials in evaluating susceptibility to different diseases or conditions such as sunscorch.

A rapid method was devised for the estimation of latex from dried macerated *Hevea* tissues using a system of extraction under reduced pressure. Estimates of latex content of different clones were made in order to expedite selection from hand-pollinated progeny families.

Field Experiments

Material bred for enhanced vigour was taken into routine tapping this year at an early stage : no set-back to growth was found to occur in the particular selections tested at Kuruwita.

Larger-scale trials of material bred for early tapping and/or disease resistance were established in the Institute's estates at Nivitigalakele and Kuruwita and on an outside estate at Moneragala. Arrangements were completed for larger-scale trials of this material in 1967 in outside estates at Neboda, Bibile and Moneragala in addition to Institute's estates at Nivitigalakele and Hedigalla.

Hand Pollination Programme

An attempt was made to operate a number of hand pollination programmes in different districts. Reasonable success obtained in this initial effort to widen the scope of the breeding programme. Much better success was obtained in selfing in the drier districts but it was found that the germination of seed obtained from drier districts was rather poor. Investigations to correct this are in progress. Some fruit was lost owing to wind damage.

The results of the annual programme are given in Table I.

Table I

No. of pollinations made / No. of fruits set

	444	451	H 440	IAN 45–710	IAN 45–873	RRIC 7	RRIC 45	RRIC 52
444	1770/158							
451		1031/33		1379/156				
AVROS 157		214/3						
Ch 26		119/6		2386/83	754/17			
H 440			626/26					
IAN 45–710		413/6		4897/218				
IAN 45–873					1818/18			
RRIC 7						4000/20		
RRIC 36					580/12			
RRIC 45					972/2			
RRIC 52				531/27				5164/28

Epiphytotic Induction

Some of the clones selected for small-scale trial in Dartonfield (Trial 8) were planted in a test nursery at Clodagh Group and the following observations on the incidence of *Oidium* leaf disease were made :—

Clone	Parentage	Susceptibility to *Oidium* leaf disease
5326	RRIC 51 × F 4542	No infection
5250	RRIC 52 × IAN 45–710	Very little infection
5352	RRIC 52 × IAN 45–710	
6306	RRIC 36 × FX 516	
8440	RRIC 52 × IAN 45–710	
2412	RRIC 45 × FX 4098	Appreciable infection
2416		
2417		
2419		
2473	RRIC 45 × IAN 45–873	
2479		
6182	PB 28/59 × IAN 45–873	
5323	PB 28/59 × FX 516	Heavily infected
8768	*H. Spruc.* × RRIC 51	

Resistance Breeding

Breeding for Oidium Resistance

Oidium Testing Station — Kepitigalla Group — Matale

More trees of the clones in this area were brought into tapping in 1966. Exceptionally vigorous growth of a larger number of trees was shown by clone 1010. A severe drought during the year depressed the 1966 yields (Table II).

TABLE II

Kepitigalla — Tapped S/2, d/3, 67% intensity

Yield in grammes per tree per tapping

Clone	Parentage	No. of trees	Girth at 152 cms. (60") in		Yield in grams per tree per tapping 1965	Yield in grams per tree per tapping 1966
			ins.	cms.		
		1959 Planting				
444	RRIC 52 ×PB 86	2	20·0	50·8	13·1	13·0
1004	T 170 ×RRIC 52	3	19·37	49·2	15·4	13·9
1010	,, × ,,	7	19·88	50·5	6·3	6·2
IAN 45–710	PB 86 ×F 409	5	18·39	46·7	18·0	14·4
RRIC 52	—	4	19·57	49·7	3·4	4·3
		1960 Planting				
451	RRIC 52 ×PB 86	1	19·09	48·5	15·4	14·2
614	,, × ,,	2	18·58	47·2	9·4	11·9
815	PB 5/139 ×RRIC 52	2	19·49	49·5	—	9·3
828	,, × ,,	1	19·69	50·0	4·3	6·5
864	,, × ,,	1	22·23	59·1	4·4	6·2
1103	RRIC 52 ×RRIC 7	1	20·98	53·3	—	7·0
1108	,, × ,,	1	16·49	41·9		9·3
IAN 6497	IAN 2818 ×PB 86	1	18·98	48·2		10·4

Of particular interest are the relatively high indices of yields of some of these clones tested on the Hamaker-Morris-Mann system at Kuruwita and Nivitigalakele in Trials 4 and 5.

Oidium Testing Station — Clodagh Group — Matale

This experiment was rather retarded in growth due to the severe drought during the year but there were no casualities. Clones 828 and 1103 did not show very much set-back.

Breeding for Gloeosporium resistance — Nakiadeniya Group — Udugama

This area was thinned to its normal density by uprooting the intervening PB 86 plants. A few plants of clone PB 86 were retained to serve as control clones. In these control trees a mild attack of *Gloeosporium* was observed during the year. Clones RRIC 50, 2018 and 3229 showed a mild attack of *Gloeosporium* leaf-fall. One tree of IAN 6585 was attacked by Pink disease. Exceptionally satisfactory growth was shown by the *Oidium*-tolerant clones 1108 and 815.

Breeding for Phytophthora Resistance

Phytophthora Testing Station — Peenkande Group — Nivitigala

Owing to dry weather during the year there was hardly any *Phytophthora* leaf-fall in this area. The yields of the experimental clones in this area are given in Table III.

TABALE III

1960 N.E. REPLANTED AREA — PEENKANDE

Tapped S/2, d/3, 67%

First tapped June 1965

Yield in grammes per tree per tapping

Clone	Parentage	Trees tapped	Girth in		Yield in grammes 1965	Yield in grammes 1966
			cms.	ins.		
687	PB 86 ×RRIC 52	1	46·74	18·4	8·5	16·5
690	,, × ,,	1	48·26	19·0	7·4	14·7
691	,, × ,,	2	49·78	19·6	13·4	28·7
788	PB 5/139 ×RRIC 52	1	54·36	21·4	14·5	25·9
1067	T 792 ×RRIC 52	1	53·59	21·1	8·7	12·4
1142	LCB 1320×RRIC 45	1	50·80	20·0	8·0	13·3
1280	Ch 26 ×RRIC 52	1	56·39	22·2	7·5	14·7
1289	RRIC 52 ×RRIC 86	2	59·94	23·6	12·6	15·0
1460	,, ×T 792	2	50·80	20·0	7·5	11·2
1461	,, × ,,	1	57·15	22·5	18·7	26·5
FX 590	F 4542 ×Tjir 1	1	48·77	19·2	7·6	29·7
PB 86	—	2	45·47	17·9	12·2	29·0

Hevea Breeding Stations — Moneragala District

Crown-budded Area — Nakkala Estate

A number of selfs were made of clone RRIC 7 and a few seedlings obtained for future breeding work. It was observed that clone RRIM 623 was in flower ; also that one tree of this clone had the main branch snapped off by wind pointing to rather poor adhesion of the main branches of the tree to the trunk.

Supplementary Trial — Kumarawatte Group

110 of the better grown trees in this area showed an average girth of 40·7 cms. at a height of 90 cms. (36″). Kuruwita test material clones 1173, 1174, 734 and 1316 (Trial I) were found to be growing satisfactorily in Moneragala also. Clone 1923 though backward in Kuruwita showed exceptional vigour at Moneragala indicating a particular suitability for drier conditions.

Trial 1

1961 Small-scale Clone Trial, Kuruwita — South West planting

The clones in this trial were bred mainly for the purpose of obtaining increased vigour. The initial girth figures showed a favourable rate of increase of girth. In order to offset one of the main disadvantages of natural rubber — the time lag of seven years between planting and tapping — this clearing was brought into tapping at four and a half years of age, with the expectation that the girthing of the trees would not be unduly diminished by early tapping. Girth measurements taken after one year's tapping confirmed that there was no appreciable set-back. A selection of 50 of the best grown PB 86 trees served as a control. Except for 1 tree of clone 254 there were no cases of Brown Bast recorded in this experiment. A girth of 42 cms. (17 ins.) at a height of 90 cms. (36 ins.) was taken as sufficient to commence tapping. Bark renewal throughout the clearing was satisfactory.

The inherited vigour was obtained largely either from RRIC 52 or from Ch 26. In the case of Ch 26, which is of parentage Br 2 × Br 2, the increase of vigour appears to be of a heterotic nature. Unfortunately it is not possible at the moment to obtain more homozygosity for production of heterosis as the fertility of *Hevea* decreases very sharply on selfing.

Though one or two more years testing is necessary the possibility of "quicker starters" in *Hevea* seems quite positive.

TABLE IV

1961 SMALL-SCALE CLONE TRIAL KURUWITA

Tapped S/2, d/3, 67%, first tapped January 1966

Yield in grammes per tree per tapping

Clone	Parentage	Trees tapped	Girth at 90 cms. 1965		Girth at 150 cms. 1966		Yield in grammes 1966
			cms.	ins.	cms.	ins.	
† 1174	Ch 26 × RRIC 7	6	60·2	23·70	57·9	22·80	64·4
† 1167	,, × ,,	3	56·1	22·09	54·7	21·54	62·0
1305	RRIC 41 × Ch 26	3	55·3	21·77	59·2	23·31	57·5
266	Mil 3/2 × Tjir 1	2	51·1	20·12	52·2	20·55	47·7
1173	Ch 26 × RRIC 7	10	53·3	20·98	54·8	21·57	47·1
254	Mil 3/2 × Tjir 1	3	51·6	20·31	56·3	22·17	46·4
* 1305	RRIC 41 × Ch 26	5	46·6	18·35	51·3	20·20	44·2
708	PB 86 × RRIC 36	3	48·5	19·09	49·3	19·41	43·8
1222	Ch 26 × RRIC 36	2	46·6	18·35	51·3	20·20	41·4
† 1286	Ch 26 × RRIC 52	3	57·4	22·60	55·3	21·77	40·5
663	RRIC 52 × PB 86	3	48·5	19·09	49·7	19·57	39·5
1157	RRIC 74 × Ch 26	3	49·2	19·37	52·4	20·63	38·8
316	Tjir 1 × RRIC 50	4	49·1	19·33	52·7	20·75	36·8
† 407	Tjir 1 × RRIC 50	4	46·0	18·11	45·8	18·03	36·0
1152	RRIC 45 × RRIC 13	7	48·0	18·90	49·2	19·37	35·8
† 1177	Ch 26 × RRIC 7	5	55·6	21·90	53·5	21·06	35·3
PR 253	Pil A 44 × PR 107	3	50·8	20·00	52·8	20·76	34·5
1380	PB 86 × RRIC 7	7	46·9	18·46	46·3	18·23	34·2
* 663	RRIC 52 × PB 86	10	48·4	19·06	49·3	19·41	34·0
1290	RRIC 52 × RRIC 86	3	53·5	21·06	59·9	23·53	33·6
1360	RRIC 45 × RRIC 51	5	47·9	18·86	48·1	18·94	33·5
* 1152	RRIC 45 × RRIC 13	3	47·6	18·74	49·8	19·61	33·3
	Mil 3/2 × Tjir 1	5	51·6	20·31	56·3	22·17	33·0
724	PB 86 × RRIC 36	5	49·6	19·53	48·2	18·98	32·4
* 266	Mil 3/2 × Tjir 1	7	53·3	20·98	53·7	21·14	30·3
* 724	PB 86 × RRIC 36	3	47·1	18·54	45·5	17·91	29·6
* 1290	RRIC 52 × RRIC 86	4	53·5	21·06	59·9	23·58	28·9
734	RRIC 52 × Tjir 1	8	51·5	20·28	55·6	21·89	28·8
785	PB 5/139 × RRIC 52	3	55·1	21·69	54·7	21·54	28·0
82	RRIC 41 × RRIC 10	6	51·2	20·16	53·9	21·22	27·5
1361	RRIC 45 × RRIC 51	5	52·6	20·71	51·0	20·08	27·3
PB 86 (control)	—	50	45·1	17·76	47·3	18·62	26·0
* 785	PB 5/139 × RRIC 52	7	48·7	19·17	50·1	19·72	24·1

* replication

† markedly tapering stem.

Trial 2

1961 Clone Trial — Kuruwita — N.E. Planting

A few clones in this area were taken into routine tapping in 1966 along with the 1961 South West planting.

Clone C 695 imported from the Firestone Plantations in Liberia showed a very high yield (58 g) on early tapping. The results of tapping the 40 tree plot of this clone commencing in 1967 should be of considerable interest.

The *Dothidella*-resistant clone IAN 2903 showed a yield of more than 40 g but so far did not show susceptibility to Bark Canker reported for this clone from Liberia. Other clones tapped from April 1966 at 67% intensity, which showed a yield of more than 30 g per tree per tapping were IAN 2829, IAN 2878 and IAN 2965.

The RRIM selection ES 3 also gave an average yield of over 25 g per tree per tapping.

The absence of Ch 26 from the parentage of hand-pollinated progeny selected for this trial appears to have reduced considerably the number of clones available for early tapping.

Trial 3

1962 — Clone Trial — Kuruwita

The girth measurements for this area are given in Table V. The mean girth for the area was 29·9 cms.

TABLE V

1962 CLONE TRIAL — KURUWITA

Girth measurements

Clone	No. of trees	Girth in 1965		Girth in 1966		Increase 65/66 in	
		ins.	cms.	ins.	cms.	cms.	ins.
AVROS 529	123	8·30	21·08	13·04	33·12	12·04	4·74
AVROS 2037	236	7·70	19·56	11·69	29·69	10·13	3·99
Harbel 1	252	6·50	16·51	9·12	23·16	6·65	2·62
IAN 45–717	236	7·30	18·54	11·03	28·02	9·48	3·73
IAN 6497	119	6·10	15·49	9·35	23·75	8·26	3·25
IRCI 7	129	7·50	19·05	72·10	30·73	11·68	4·60
IRCI 9	123	6·70	17·02	10·44	26·52	9·50	3·74
PB 86	212	8·00	20·32	11·82	30·02	9·70	3·82
PR 228	124	7·40	18·80	10·95	27·81	9·01	3·55
PR 251	129	7·20	18·29	11·23	28·52	10·23	4·03
PR 259	132	5·80	14·73	9·16	23·27	8·54	3·36
RRIC 7	136	6·90	17·53	10·35	26·29	8·76	3·45
RRIC 14	223	11·40	28·96	15·89	40·36	11·40	4·49
RRIC 36	242	8·00	20·32	11·91	30·25	9·93	3·91
RRIC 37	132	6·80	17·27	12·03	30·56	13·29	5·23
RRIC 41	121	10·10	25·65	15·73	39·95	14·30	5·63
RRIC 45	252	8·20	20·83	12·95	32·89	12·06	4·75
RRIC 51	262	8·40	21·34	13·17	33·45	12·11	4·77
RRIC 52	276	9·40	23·88	14·02	35·61	11·73	4·62
RRIM 607	245	6·40	16·26	10·71	27·20	10·94	4·31
RRIM 623	255	10·70	27·18	16·13	40·97	13·79	5·43
RRIM 628	174	5·30	13·46	8·11	20·60	7·14	2·81
RRIM 701	246	10·00	25·40	14·03	35·64	10·24	4·03
RRIM 707	221	7·40	18·80	11·39	28·93	10·13	3·99
WR 101	117	9·10	23·11	14·17	35·99	12·88	5·07
TR 3702	255	5·90	14·99	10·22	25·96	10·97	4·32
TR 1548	246	6·80	17·27	11·41	28·98	11·71	4·61

Trial 4

1962 Small-scale Clone Trial — Kuruwita

A Hamaker-Morris-Mann early tapping test was carried out in this area. H.P. clone 1458 showed the highest yield index and the following order of yields was noted :

TABLE VI

1962 SMALL-SCALE CLONE TRIAL — KURUWITA

Yield index on early tapping

Clone	Parentage	No. of trees tapped	Girth at 90 cms. (36") in		Yield in g per tree per tapping
			cms.	ins.	
1458	LCB 1320 × RRIC 7	10	41·66	16·4	25·1
*RRIM 623	PB 49 × Pil B 84	10	42·67	16·8	17·6
1103	RRIC 52 × RRIC 7	6	39·37	15·5	15·9
2005	PR 107 × LCB 1320	7	35·81	14·1	13·6
*PB 86	—	10	33·78	13·3	12·7
2002	LCB 1320 × GPM 1	9	39·12	15·4	12·6
PB 28/59	—	7	26·16	10·3	10·3
1317	RRIC 45 × LCB 1320	7	31·75	12·5	8·8
815	PB 5/139 × RRIC 52	10	39·37	15·5	8·3
1108	RRIC 52 × RRIC 7	9	37·34	14·7	7·6
2028	,, × ,,	8	33·02	13·0	7·5
828	PB 5/139 × RRIC 52	10	35·56	14·0	5·4
784	,, × ,,	10	34·54	13·6	5·3
2124	RRIC 52 × Wagga 6278	10	35·81	14·1	5·1
1141	LCB 1320 × RRIC 45	9	33·53	13·2	5·1
IAN 45–713	PB 86 × F 409	9	26·16	10·3	5·1
*RRIC 52	—	10	40·64	16·0	5·0
864	PB 5/139 × RRIC 52	8	35·05	13·8	4·9
759	RRIC 52 × Tjir 1	8	36·07	14·2	4·2
566	RRIC 52 × PB 86	9	32·26	12·7	3·4
1009	T 170 × RRIC 52	8	31·75	12·5	3·2
1018	,, × ,,	10	31·75	12·5	3·2
FX 3925	F 4542 × AVROS 363	9	25·65	10·1	3·2

* Selected 10 trees from larger-scale planting.

Of interest are the relatively high levels of yields of some of the clones found tolerant to *Oidium* at Kepitigalla. This would permit the further trial of clones such as 1103, 815, 1108 over a wide range of planting districts.

Trial 5

1962 Small-scale Clone Trial — Nivitigalakele

A Hamaker-Morris-Mann early tapping test was carried out in this area also and the results are as follows :—

TABLE VII

1962 SMALL-SCALE CLONE TRIAL — NIVITIGALAKELE

Yield index on early tapping

Clone	Parentage	No. of trees tapped	Girth at 90 cms. (36″) in		Yield in grams per tree per tapping
			cms.	ins.	
PB 28/59	—	6	41·91	16·5	28·6
*RRIM 628	Tjir 1 × RRIM 527	10	33·78	13·3	18·8
1103	RRIC 52 × RRIC 7	10	41·40	16·3	18·7
1458	LCB 1320 × RRIC 7	10	40·64	16·0	18·4
RRIC 7	—	8	34·29	13·5	17·4
1317	RRIC 45 × LCB 1320	10	39·11	15·4	15·1
82	RRIC 41 × RRIC 10	8	43·94	17·3	14·3
RRIC 45	RRIC 8 × Tjir 1	10	36·58	14·4	13·1
*PB 86	—	10	32·51	12·8	12·9
*RRIC 36	PB 86 × PR 107	10	32·51	12·8	12·3
1009	T 170 × RRIC 52	10	40·64	16·0	11·6
815	PB 5/139 × RRIC 52	9	37·08	14·6	11·4
RRIC 52	—	8	39·62	15·6	9·2
IAN 6497	IAN 2818 × PB 86	8	30·48	12·0	7·9
759	RRIC 52 × Tjir 1	10	36·83	14·5	7·4
Harbel 1	—	9	28·45	11·2	6·9
566	RRIC 52 × PB 86	10	34·54	13·6	5·3

* Selected 10 trees from larger-scale planting.

The high-yielding potential of clone 1458 and *Oidium* tolerant clone 1103 was further confirmed in this test run concurrently with that at Kuruwita (Trial 4).

Trial 6

1963 Small-scale Clone Trial — Kuruwita

The girth measurements for this area are given in Table VIII.

TABLE VIII

1963 SMALL-SCALE CLONE TRIAL—KURUWITA

Girth measurements at 90 cms. height

Clone	Parentage	No. of trees	Girth in 1966	
			cms.	ins.
108	BD 10 × PR 107	7	23·1	9·09
276	RRIC 52 × PB 5/139	6	22·8	8·98
466	RRIC 52 × PB 86	7	24·3	9·57
1635	Tjir 1 × LCB 1320	8	24·3	9·57
3278	,, × ,,	6	30·4	11·97
3279	,, × ,,	6	24·3	9·57
3282	,, × ,,	8	23·8	9·37
1620	,, × ,,	6	24·3	9·57
1628	,, × ,,	4	25·4	10·00
739	RRIC 52 × Tjir 1	5	28·7	11·30
777	,, × ,,	7	28·9	11·38
779	,, × ,,	10	21·3	8·39
1273	Ch 26 × RRIC 52	7	27·9	10·98
1281	,, × ,,	6	23·8	9·37
2220	RRIM 513 × LCB 1320	10	28·7	11·30
2228	,, × ,,	10	33·5	13·19
2232	,, × ,,	10	28·4	11·18
2205	,, × ,,	8	16·2	6·38
1501	RRIC 45 × GPM 1	10	22·8	8·98
1516	,, × ,,	8	25·6	10·08
1831	RRIC 45 × LCB 1320	6	25·4	10·00
1866	,, × ,,	7	20·8	8·19
3570	,, × ,,	5	19·3	7·54
3606	,, × ,,	5	25·4	10·00
3607	,, × ,,	3	25·9	10·20
1894	RRIC 51 × LCB 1320	9	23·1	9·09
2011	RRIC 52 × RRIC 7	5	26·6	10·47
2029	,, × ,,	9	22·1	8·70
2044	,, × ,,	9	24·1	9·49
2053	,, × ,,	9	23·8	9·37
2114	RRIC 52 × Wagga 6278	10	22·8	8·98
2120	,, × ,,	8	25·9	10·20
2122	,, × ,,	10	28·4	11·18
2123	,, × ,,	8	28·9	11·38
2127	,, × ,,	8	21·3	8·39
2133	RRIC 36 × RRIC 52	9	16·5	6·50
1714	RRIC 51 × PR 107	8	21·8	8·58
1729	,, × ,,	8	19·0	7·48
2135	PB 86 × RRIC 7	5	22·3	8·78
2163	RRIC 45 × RRIC 36	8	25·4	10·00
2164	,, × ,,	8	22·8	8·98
2169	PB 86 × RRIC 52	7	29·2	11·50
2170	,, × ,,	8	26·6	10·47
2265	RRIC 52 × LCB 1320	9	26·6	10·47
2268	,, × ,,	8	23·8	9·37
2270	,, × ,,	10	19·5	7·68
2273	RRIC 52 × RRIC 36	8	22·3	8·78
2275	,, × ,,	9	21·5	8·46
2276	RRIM 513 × RRIC 36	9	27·4	10·79
2284	,, × ,,	8	26·4	10·39
2286	,, × ,,	7	26·6	10·47
2298	,, × ,,	8	19·0	7·48
2299	,, × ,,	7	20·5	8·07
2303	RRIC 52 × AVROS 157	8	21·0	8·27
2305	,, × ,,	8	25·9	10·20
2309	,, × ,,	9	24·6	9·69
2317	,, × ,,	7	27·9	10·98

TABLE VIII (*Contd.*)

Clone	Parentage	No. of trees	Girth in 1966	
			cms.	ins.
2974	RRIC 36 × RRIC 88	6	20·5	8·07
2992	RRIC 36 × Ch 26	8	26·6	10·47
2994	,, × ,,	8	24·8	9·76
2996	,, × ,,	7	24·6	9·69
3059	Ch 26 × Wagga 6278	10	25·1	9·88
3060	,, × ,,	8	27·1	10·67
3071	RRIC 45 × ,,	4	26·4	10·39
3076	,, × ,,	6	21·0	8·27
3101	,, × ,,	4	24·3	9·57
3106	,, × ,,	6	26·9	10·59
3131	LCB 1320 × Wagga 6278	6	24·8	9·76
3137	,, × ,,	5	15·4	6·06
3147	LCB 1320 × LCB 1320	3	25·1	9·88
3148	,, × ,,	3	29·2	11·50
3151	,, × ,,	3	24·6	9·69
3180	Tjir 1 × Ch 26	3	24·1	9·49
3182	,, × ,,	2	25·6	10·08
3313	Ch 26 × RRIC 36	3	26·4	10·39
3333	,, × ,,	7	28·1	11·06
3351	,, × ,,	6	22·1	8·70
4008	RRIC 52 × RRIC 52	7	25·9	10·20
4010	,, × ,,	9	30·4	11·97
4011	,, × ,,	7	23·8	9·37
FX 3925	F 4542 × AV 363	7	23·1	9·09
T 57	PR 107 × Nab 20	10	22·6	8·90
T 132	RRIC 37 × Wagga 6278	8	23·6	9·29
T 140	,, × ,,	7	23·3	9·17
3183	Wagga 6278 × LCB 1320	5	22·3	8·78
3185	,, × ,,	10	25·1	9·88
3186	,, × ,,	4	19·3	7·54
3787	RRIC 88 × RRIC 36	6	20·5	8·07
PB 86	—	80	19·0	7·48
IAN 6505	—	7	17·4	6·71
GT 711	—	8	23·3	9·17

Trial 7

1964 Clone Trial — Kuruwita (South West Planting)

The girth measurements for this area are as follows :—

TABLE IX

1964 CLONE TRIAL — KURUWITA

Girth measurements

Clone	No. of trees	Average girth in	
		cms.	ins.
RRIC 50	88	12·1	4·76
,,	88	12·2	4·80
RRIC 55	112	11·0	4·33
,,	99	15·2	5·98
,,	101	12·4	4·88
RRIC 59	96	12·2	4·80
,,	91	12·0	4·72
RRIC 60	122	11·9	4·69
,,	103	12·6	4·96
,,	88	12·4	4·88
864	110	14·1	5·55
759	80	13·4	5·28
815	49	15·7	6·18
1108	79	15·3	6·02
6338	12	15·7	6·18
PB 86	93	12·2	4·80

Mean for area = 12·8 cms.

1964 N.E. Planting — Kuruwita

The girth measurements for this area are as follows :—

TABLE X

1964 N.E. PLANTING — KURUWITA

Girth measurements

Clone	Parentage	No. of trees	Girth in 1966	
			cms.	ins.
566	RRIC 52 × PB 86	30	13·9	5·47
759	RRIC 52 × Tjir 1	28	12·7	5·00
784	PB 5/139 × RRIC 52	28	13·5	5·31
815	,, × ,,	22	13·9	5·47
864	,, × ,,	38	14·9	5·87
864	,, × ,,	30	13·3	5·24
1103	RRIC 52 × RRIC 7	36	15·1	5·94
1103	,, × ,,	32	14·8	5·83
1108	,, × ,,	42	14·9	5·87
1108	,, × ,,	31	14·9	5·87
1108	,, × ,,	29	14·2	5·59
1108	,, × ,,	176	13·3	5·24
PB 86	—	37	11·2	4·41
1269	Ch 26 × RRIC 52	14	16·9	6·61
2981	RRIC 36 × RRIC 52	15	14·4	5·67
2987	,, × ,,	16	13·0	5·12
2988	,, × ,,	10	15·9	6·26
6308	LCB 1320 × RRIC 7	16	14·0	5·51
6309	,, × ,,	28	14·4	5·67
6310	,, × ,,	26	17·9	7·05
6323	,, × ,,	29	16·7	6·58
6326	,, × ,,	29	15·6	6·14
6327	,, × ,,	30	18·0	7·09
6328	,, × ,,	28	16·6	6·54
6333	,, × ,,	12	17·1	6·73
6336	,, × ,,	26	16·5	6·50
258	Mil 3/2 × Tjir 1	20	15·0	5·91
266	,, × ,,	21	15·7	6·18
279	Wagga 6278 × Tjir 1	8	16·9	6·61
359	Tjir 1 × RRIC 50	24	17·9	7·05
506	RRIC 52 × PB 86	11	18·1	7·13
513	,, × ,,	10	15·8	6·22
885	PB 5/139 × RRIC 52	10	14·3	5·63
1152	RRIC 45 × RRIC 13	24	16·2	6·38
1290	RRIC 52 × RRIC 86	14	16·1	6·34
1361	RRIC 45 × RRIC 51	12	13·6	5·35
RRIC 55	PB 86 × Wagga 6278	37	12·7	5·00
	Mean for area		13·3	5·24

Of interest are the satisfactory growth of *Oidium*-tolerant clones such as 1103 and 1108 (Trials 3 and 4) and high-yielding clones such as 1152 and 266 (Trial 1, Table IV).

Trial 8

1965 Small-scale Clone Trial — Dartonfield

Routine attention was given to this trial.

Trial 9

1965 Small-scale Clone Trial — Kumarawatte — Moneragala

Routine attention was given to this trial. First year survival was very satisfactory in this district on clones 451, 1259, RRIM 623 and RRIC 89. Clones 451 and 1174 showed the best growth.

Trial 10

1965 Clone Trial — Clodagh Group

All the Kepitigalla selections, *viz.* clones 444, 1010, 451, 1108, 1004, 815, 828, 864 and IAN 45–710 were free of *Oidium* infection. Of the selections from the 1963 planting at Clodagh Group only clones 2317 (RRIC 52 × AV 157), 2413 (RRIC 45 × FX 4098), 5329 (IAN 3434 × RRIC 52) and 6004 (RRIC 52 × IAN 2750) showed no sign of *Oidium* infection. Clone 4011 (RRIC 52 × RRIC 52) showed considerable susceptibility and retarded growth.

Trial 11

1966 Clone Trial — Kuruwita

A clone trial of three replications of 100 plants each of the following clones was planted at Kuruwita during the South West monsoon :—

Clone	Parentage	Remarks
451	RRIC 52 × PB 86	*Oidium* tolerant. Vigorous
828	PB 5/139 × RRIC 52	,, ,, ,,
1004	T 170 × RRIC 52	,, ,, ,,
1174	Ch 26 × RRIC 7	High yielding ,,
RRIC 45	RRIC 8 × Tjir 1	Control

Trial 12

1966 Clone Trial — Nivitigalakele

Three replications of 100 plants each of clones 451, and 1004 were planted during the South West monsoon with 3 replications of RRIC 45 as control.

Trial 13

1966 Clone Trial — Kumarawatte — Moneragala

Three replications of 150 plants each were planted during the North East monsoon at Kumarawatte Group. The clones were as follows :—

Clone	Parentage	Remarks
415	RRIC 52 × PB 86	*Oidium* tolerant — vigorous
815	PB 5/139 × RRIC 52	,, ,, ,,
1004	T 170 × RRIC 52	,, ,,
1010	,, × ,,	,, ,, ,,
1923	RRIC 51 × LCB 1320	Suited to district
RRIC 89	—	Control
RRIM 623	PB 49 × Pil B 84	Control

Bud dormancy presents a serious problem in these drier areas. An attempt was made to overcome this by dipping the cut ends of the budded stumps in a concentrated proprietary organic fertilizer prior to waxing. In contrast to previous experience, and an adjoining experimental clearing which served as a control, about 15% of these plants were found to have developed a healthy shoot within eight weeks after planting. Further work in connection with this methods of bud stimulation is in progress.

INDEX TO TRIALS

REVIEW OF THE PLANT PATHOLOGY DEPARTMENT

By

O. S. PERIES

SUMMARY

Dr. O. S. Peries, Head of the Plant Pathology Department, continued his duties as Co-ordinator of the International Rubber Research and Development Board. In this capacity he was invited to Malaya by the Rubber Research Institute of Malaya to advise them on the control of *Phytophthora* leaf disease of *Hevea*, which had occurred for the first time in epidemic proportions in that country.

Dr. (Mrs.) V. Satchuthananthavale, Assistant Plant Pathologist, returned to the island on the 28th November, 1966, after successfully completing her post-graduate studies overseas.

Mr. Marcus Fernando, Technical Assistant, was away from the island for 6 months, from April to October, doing a course in fungal identification at the Commonwealth Mycological Institute, Kew, Surrey, England.

Studies on the biology of spore germination in *Oidium heveae* were continued and have shown that the conidia of the fungus can survive for long periods at low humidities, and large numbers of them will germinate when maintained over fused calcium chloride.

Gloeosporium alborubrum was found to sporulate most profusely at high humidity and relatively low temperatures. This fungus is rather sensitive to temperature, however, and will not sporulate above 30°C or below 18°C. Clone PB 86 was again found to be the most susceptible clone, popularly grown in Ceylon, to this disease. Leaves washed in water were found to be more susceptible to infection by this fungus than unwashed leaves.

Phytophthora spp. were found to grow profusely in basic synthetic media, as long as Vitamin B_1 was provided.

In studies on the sexual compatibility of the fungus, it was found that all 31 isolates collected from one estate belonged to the same group, the significance of this finding is discussed.

Studies on physiologic specialization of the fungus, *P. meadii*, have shown that there are at least 5 races of this fungus in Ceylon, and that these races can be identified on the basis of infection of five differential clones.

The epidemiology of *Phytophthora* leaf disease has been discussed in detail, with particulars on the perennation of the fungus, its dispersal and the effect of weather conditions on the spread of the disease.

In studies on the histology of Bark Rot infected tissue, it has been found that the fungal hyphae can pass readily through cell walls, and that the hyphae are almost exclusively intracellular.

Two fungicides 'Cerano N' and 'Pantox' were tested for suitability for Bark Rot control, but both were found unsuitable for the purpose. On the other hand 'Fomac 2', a fungicide based on PCNB, has been found to be very effective in preventing the infection of rubber roots by *Fomes lignosus*. The basis of its action has been explained and its use as a collar protectant has been discussed.

Pot experiments have confirmed that sulphur is effective in suppressing the incidence of *Fomes* when introduced to the soil. The basis of the action of sulphur has been found to be that it selectively suppresses the growth of all fungi except *Trichoderma viride*, which is antagonistic to *Fomes*.

The incidence of all three leaf diseases, *Oidium*, *Phytophthora* and *Gloeosporium* were extremely low during 1966. The weather conditions prevailing during the *Oidium* and *Phytophthora* seasons were mainly responsible for the low incidence of these diseases.

In field experiments on White Root disease control, it has been found that the incidence of *Fomes* has been significantly less in sulphur-treated areas than in untreated areas. The three experiments on the methods of identification and control of *Fomes* have been concluded and the results discussed in detail.

Inoculations carried out throughout the year have shown that the infection of *Hevea* bark by *P. meadii* occurs irrespective of weather conditions, as long as the inoculum is present and the bark is injured. This has confirmed the importance of the prohibition of tapping wet bark, in the control of Bark Rot.

None of the thirteen field experiments carried out for *Oidium* and *Phytophthora* leaf disease control gave significant results, because of the low incidence of these diseases throughout the country this year.

Small-scale field and laboratory experiments have shown the possibility of using organo-mercurial fungicides for the control of leaf diseases.

Two spraying machines were tested during the year, and the results were discussed with the firms supplying them, and advice given on improving their performance.

PUBLICATIONS

PERIES, O. S. and Dayaratne, W. C. Studies on copper fungicides I. Biological efficacy of copper spray deposits containing various 'stickers' *Rubb. Res. Inst. Ceylon Quart.* J. **43** (in the press).

PERIES, O. S. Brown Root Disease. Advisory Circular. Completely revised.

DETAILED REVIEW

LABORATORY WORK

Diseased Specimens :

A list of the pathogenic fungi and pests isolated from specimens forwarded to the Institute, for disease identification and report, in connection with advisory work, is given below :

Causal agents of disease	No. of cases
(*a*) Fungi	
Fomes lignosus	3
Gloeosporium alborubrum ..	2
Oidium heveae	3
Phytophthora meadii	3
(*b*) Pests and other causes	
Brown Bast	1
Mites	2
Sun Scorch	3
Total ..	17

Biology of the Fungal Pathogens of Hevea

Oidium heveae :

Biology of Spore Germination : The incidence of *Oidium* leaf disease was the lowest on record for a number of years, with the result that no further studies could be carried out on this subject up to the end of March. Some *Oidium* spores became available in April, as flowers on mature areas became infected and the infection spread to the one acre area in Dartonfield, where the trees are pruned each year, to keep them short, in order to facilitate observations on the incidence of leaf diseases. Therefore, some vital confirmatory information on the effect of humidity, ultra-violet light and sunlight on conidial germination was obtained.

It was confirmed that the conidia of *O. heveae* can survive for comparatively long periods and germinate under conditions of extremely low atmospheric humidity. Between 10 and 20 per cent of fresh conidia regularly germinated when maintained over fused calcium chloride.

Both direct sunlight and ultra-violet light are lethal to conidia, which disintegrate on exposure for short periods to either. However, direct sunlight and ultra-violet light are not quite as lethal to the conidia of *O. heveae* as to the zoospores of *P. meadii*, please see Peries & Fernando (1966). This proves the relationship between fungi and environmental conditions; *Oidium* leaf disease is a dry weather disease, which occurs mainly during the period February–April, which are dry, sunny months, whereas *P. meadii* is essentially a wet weather disease, occurring during the South West monsoon season, when there is little sunlight, but high humidity (O. S. Peries, S. K. Samaraweera and D. A. Jayasekere).

Gloeosporium alborubrum :

Effect of Environment on Sporulation : Preliminary studies were carried out to assess the effect of temperature and relative humidity on the sporulation of *G. alborubrum*, on immature rubber leaves, to establish the correlation between weather conditions and the incidence and spread of *Gloeosporium* leaf disease.

The results available up to date have indicated that *G. alborubrum* sporulates most profusely at high humidity, 85%, and a temperature of 25°C, which is slightly below the normal room temperature in the wet Low Country districts of Ceylon. However, the fungus will sporulate at low humidities, even at 35% RH, but it is rather sensitive to temperature and produces very few spores at temperatures above 30°C and below 18°C. (O. S. Peries, D. L. S. Wimalajeewa and D. A. Jayasekera).

Intensity of Sporulation : Further studies were carried out on the intensity of sporulation of *G. alborubrum* under field conditions at different times of the year. In these studies, assessments were made of the number of spores produced by *G. alborubrum* on unit weights, which can be converted into unit areas, of rubber leaves at regular intervals throughout the year.

This year's results confirmed those of last year, in that it was found that the intensity of sporulation was highest during wet weather periods and that the peaks of sporulation were recorded in July and November which were the wettest months of the year. However, considerable numbers of spores were produced even in dry weather periods, which indicates that one of the reasons for the success of this fungus as a pathogen of *Hevea* right through the year, is its ability to sporulate under various weather conditions, so that its inoculum is aways readily available for infection of soft tissues (D. L. S. Wimalajeewa and D. A. Jayasekera).

Clonal Susceptibility : Further laboratory studies were carried out on clonal susceptibility to *Gloeosporium* leaf disease, by inoculating immature leaves of different clones under laboratory conditions.

This year's studies too have confirmed that PB 86 is the most susceptible clone, popularly planted in Ceylon, while RRIC 45, 52 and 86, Gl 1, Mil 3/2 and Wagga 6278 are the most tolerant to *Gloeosporium* leaf disease (O. S. Peries and D. A. Jayasekera).

Factors Affecting Susceptibility : The effect of the following factors on the infection of rubber leaves by *G. alborubrum* was assessed —

(*a*) Different spore concentrations.

(*b*) Washed and unwashed leaves.

(*a*) The preliminary results from these experiments have indicated that there is a direct relationship between percentage infection and spore concentration, up to a point. However, highly concentrated spore suspensions were found to be less effective than medium concentrations. This may be related to the phenomenon of " self-inhibition " of germination observed in the case of many fungal spores in highly concentrated suspensions. Wimalajeewa (1967) has demonstrated this phenomenon in his studies on the physiology of spore germination in this fungus.

(*b*) Washed leaves were found to be much more susceptible to infection by *Gloeosporium* than unwashed leaves. It is a well known fact that many substances are secreted on the leaf surfaces of normal healthy trees (Brown, 1922). Some of these substances like sugars and other carbohydrates are generally beneficial for the germination of spores, but there can be spore germination suppressants and even substances toxic to fungi secreted by the leaves of certain plants (Last, 1960). This may be one of the factors contributing to the greater susceptibility of washed leaves and it is quite possible that rubber leaves are themselves more susceptible to infection by *G. alborubrum* during the rainy periods of the year, as toxic secretions, if any, will be washed off the leaves rendering them more susceptible to infection.

Thus the conditions for infection seem to be more favourable during the wet seasons, as more spores and susceptible leaves from new flushes are available and the leaves too are repeatedly washed and more susceptible to infection during these periods. (O. S. Peries, D. L. S. Wimalajeewa and D. A. Jayasekera).

Phytophthora meadii :

Growth in Defined Media : The studies on the growth of *P. meadii* on defined media were continued, with the assessment of the requirement of the fungus for nitrogen and vitamins. It has been found that *P. meadii* can grow profusely on basic synthetic media, provided that it is supplied with Vitamin B_1 (O. S. Peries, T. M. Fernando and D. M. Dantanarayana).

Compatibility of Isolates : These studies were continued, and have indicated that the two sexually compatible types of *Phytophthora* may be present in a majority of Estates, but that their distribution may be unequal, one or other of the two forms being predominant in any particular estate.

Intensive studies were carried out on three selected estates from each of which at least 20 isolates were made for this purpose, Table I gives the results of this study.

TABLE I

THE OCCURRENCE OF GROUP I AND II TYPES OF PHYTOPHTHORA IN 3 SELECTED ESTATES

Name of estate	No. of isolates tested	No. in Group I	No. in Group II
Ellakande	31	31	0
Culloden	20	15	5
Dartonfield	20	7	13
Total	71	53	18

These results are rather interesting, because they have indicated that only Group I Phytophthoras occur at Ellakande Estate. This result should be confirmed during the next *Phytophthora* leaf-fall season, as Ellakande is an estate where the incidence of *Phytophthora* Bark Rot and leaf-fall has always been high. This subject is therefore worthy of detailed investigation, to establish whether *Phytophthora* diseases are consistently more virulent on estates where Group I isolates predominate ; Culloden and Dartonfield Estates being cases in point (O. S. Peries and D. M. Dantanarayana).

Physiologic Specialization : These studies, started in 1964, were concluded during the year. A total of five inoculations were carried out on seven selected clones, of varying degrees of susceptibility to Bark Rot and *Phytophthora* leaf disease. A summary of the results is presented in Table II.

TABLE II

INTENSITY OF INFECTION CAUSED BY DIFFERENT CULTURES OF PHYTOPHTHORA ON VARIOUS CLONES OF HEVEA

Clones	Culture Nos.							
	27	40	41	43	60	61	65	69
F 4542	L	H	M	H	L	N	L	L
LCB 870	H	H	VH	VH	H	N	M	M
LCB 1320	H	N	H	H	L	N	L	L
PB 86	H	H	H	H	H	N	H	H
PR 107	L	M	VH	VH	L	N	L	L
RRIC 7	L	M	H	H	L	N	L	L
RRIC 45	L	M	VH	M	L	N	L	L
RRIC 52	N	H	H	VH	L	N	L	L
Wagga 6278	L	N	H	M	L	N	L	L
	1	2	3		5	4	5	

H — highly susceptible, leaf-fall, die back

M — moderately susceptible, leaf lesions, blackening of stem

L — low susceptibility, leaf lesions

N — no symptoms

The results of the five inoculations were remarkably consistent, and showed clearly that the cultures selected fall into five groups. Culture 27 can be identified as it is the only one, apart from 61, which does not infect clone RRIC 52. Culture 40 is identified as it does not infect both LCB 1320 and Wagga 6278. Cultures 41 and 43 are highly pathogenic and cause medium to high infection of all clones. Culture 61 is non-infective to all clones and cultures 60, 65 and 69 form the last group, its pathogenicity being low on all clones. These five groups are clearly physiologic races of the fungus, culture 61 may even be considered a separate species. These five races can be identified by their reaction on the five clones — LCB 1320, PB 86, RRIC 7, RRIC 52 and Wagga 6278, and for the present it is proposed that these be used as the differential clones.

This study has proved that there are physiologic races of the fungus in Ceylon, and as *P. meadii* is a homothallic fungus, the different races of which are sexually compatible, the chances are that its variability will be extremely high. Therefore, the chances of breeding *Hevea* clones resistant to *Phytophthora* diseases is likely to be very low (O. S. Peries and D. M. Dantanarayana).

Perennation of the Fungus : Studies carried out, just before the South West monsoon season 1966, confirmed that the fungus can overwinter in mummified pods, the previous season's pod stalks, the leading edges of the lesions of the previous season's infected shoots and old Bark Rot lesions. This shows that the majority of estates would have their own sources of primary infection and as long as the weather conditions necessary for the initiation of infection are fulfilled the potential for the disease is always present (O. S. Peries, S. K. Smaraweera and D. M. Dantanarayana).

Epidemiology of Phytophthora Leaf Disease : The three early months, May, June and July, of the South West monsoon season of 1966 were comparatively dry, so much so that seed-fall, which normally commences in August, started this year in the first week of July. Therefore, only a very limited amount of work was carried out in the natural spread of the disease in the field. However, the dry weather conditions once again illustrated the vital role the pods play in the epidemiology of this disease. Weather conditions became suitable for the disease, with heavy rains and floods, in the last 10 days of September. But by this time the majority of pods had been shed and few trees suffered from the disease, and these were trees bearing a late crop of pods.

It was confirmed, by means of inoculation experiments, and close observation of trees, where leaf-fall occurred following field infection by *P. meadii*, that the range of the inoculum originating from any particular source was rather narrow. Usually the inoculum is confined to the source tree alone, and the disease spreads almost entirely by means of splash dispersal. Wind appears to play a very small part in the dissemination of the disease, except in so far as it helps to carry the water droplets a short distance.

The good weather conditions prevailing during a major part of the South West monsoon season enabled us to carry out critical experiments on the infection of leaf stalks, without interference from natural infections. It was found that unlike the infection of the bark (Peries, 1965), infection of leaf stalks is closely associated with weather conditions. Petiole infection occurs readily in cool, dull, overcast, humid weather. More than 50% of petioles sprayed with a zoospore suspension during this type of weather became infected ; whereas less than 10% infection occurs in bright sunny weather, even when cotton wool saturated with a zoospore suspension is clipped round the leaf stalks. High percentage infection of leaf stalks occurred, however, when the weather conditions suitable for infection were simulated by providing shade for the inoculated leaves with cadjan thatching and increasing the humidity around them with frequent water sprays. This confirmed the close dependence of the causal fungus on suitable weather conditions to cause heavy leaf-fall.

In studies carried out to establish the period during which individual infected pods produce inoculum for the spread of the disease, it was found that sporangia can be produced on pods for periods up to 14 days after first sporulation. At the end of this period, all infected pods were usually brown and rotten, if the weather remains dull and humid, thus being suitable for the fungus. However, if dry weather follows infection, the pods would crack open or dry up and shrivel, becoming mummified, depending on whether they were mature or immature, respectively, at the time of infection (O. S. Peries and S. K. Samaraweera).

Fomes lignosus :

The Effect of Bark on Infection : Preliminary studies were carried out on the effect of bark on the rate of infection and decomposition of rubber wood by *F. lignosus*. Studies were first carried out on pure culture inoculations in Erlenmeyer flasks, followed by small-scale pot trials. These studies gave some indication that *F. lignosus* has a better chance of competing with the normal saprophytic fungal flora in the soil, when rubber wood is buried with the bark, rather than when it is stripped off the bark. These studies are worthy of repetition and confirmation, as they indicate a useful method by which the normal saprophytic fungal flora in the soil can be given a distinct advantage in the race for the colonization of rubber wood. This has possibilities for exploitation as a method of biological control of *Fomes* (O. S. Peries).

Host-Parasite Relationships

Phytophthora meadii :

Phytophthora Infection of Bark : A large number of sections of bark from Bark Rot-infected trees has been examined under the microscope. Special attention was paid to the identification of structures like haustoria and appressoria. These studies should be continued and further investigations carried out on the rate of growth of the fungus in rubber bark tissues during dry and wet seasons. The results of these studies will help in a more critical evaluation of the effects of this disease and lead to the optimum use of Bark Rot fungicides. There are indications now, from field observations, that the fungus grows rather slowly, or hibernates in the bark, during dry weather periods. Histological studies can elucidate this problem by identifying the form in which the fungus survives during these periods, which would naturally be the best time to eradicate the disease (O. S. Peries and Z. E. Irugalbandara).

Phytophthora Leaf-fall : Leaf petioles were inoculated with zoospore suspensions, and, after several attempts, we have now been able to obtain sellotape strips (Peries, 1961) and sections of the petiole showing the mode of germination, penetration and ramification of the host tissue by the fungus.

The zoospores germinate, produce a short germ tube, which flattens out to form an appressorium which produces the fine pin-like penetrating device. The hyphae of *P. meadii* appear to be able to pass through the cell walls of any petiole tissue quite readily, and the majority of hyphae observed were intracellular. (O. S. Peries, H. L. Munasinghe and Z. E. Irugalbandara).

Histological Studies on Coconut Palm : Preliminary studies were carried out on the histology of the different parts of the coconut palm, on material obtained from normal palms and those affected by leaf scorch disease. The main difference observed between the anatomy of healthy palms as compared to diseased ones was that the xylem vessels of the latter were almost completely plugged by tyloses. This indicates that the yellowing of coconut leaves, which sometimes precedes leaf scorch symptoms, may well be a drought symptom much like the yellowing of rubber leaves, following *Fomes* infection, which is essentially a starvation and drought symptom, caused by the disruption of the transport of food and water by the decay of the translocating tissue (O. S. Peries, H. L. Munasinghe and Z. E. Irugalbandara).

Bark Characteristics and Susceptibility to Bark Rot : Only a limited amount of work was done on this subject, because of illness of the officer carrying out this work and the non-availability of the necessary chemicals for these studies. However, this work was continued and the method of separation of the amino acids in the bark was studied so that as soon as the standards are available these acids can be identified.

The amino acids in the bark of clones PR 107, RRIC 45 and RRIC 52 were investigated by the electrophoresis method, using acetic acid buffer and ninhydrin reagent for preliminary identification of the different amino acids. This study too was considerably delayed because of the lack of standards for the identification of amino acids. This work should be continued and elaborated as the results obtained should prove extremely useful for the early establishment of susceptibility and resistance of different clones to diseases and perhaps in the scientific identification of clones too, for critical study (O. S. Peries and T. Shanmuganathan).

pH of Bark Extracts : The pH of the bark extracts of seven clones was recorded in order to establish whether there is any relationship between this factor and susceptibility to Bark Rot. The bark extracts were obtained by two methods, maceration and seepage, but there was no characteristic difference in the pH of the extracts of susceptible and tolerant clones (O. S. Peries, Z. E. Irugalbandara and T. Shanmuganathan).

Leaf Scorch of Coconuts : The necrotic symptoms on the leaves of coconut palms showing scorch symptoms were carefully studied to establish whether leaf necrosis is caused by a pathogen. Leaf tissue from the leading edges of the necrotic areas was cut into small pieces, passed through dilute mercuric chloride for surface sterilization, washed in 3 changes of sterile distilled water and plated on Difco Malt Agar. A majority of these leaf sections gave rise to fungal and bacterial colonies. However, most of these were clearly secondary parasites such as *Botryodiplodia* spp., *Pestalozzia* spp. and various species of *Fusarium*. Inoculations were made on healthy coconut leaves with each of the fungi and bacteria isolated, but no lesions were produced confirming that these fungi are mainly secondary parasites or pure saprophytes, which have invaded the leaf tissue dead or weakened through other causes (O. S. Peries, H. L. Munasinghe and T. Shanmuganathan).

Culture Collection : The culture collection of plant pathogenic organisms received routine attention during the period under review, cultures being transferred on to new media, where necessary (S. K. Samaraweera).

Rhizobia Cultures : Cultures of selected strains of Rhizobia were maintained in the laboratory, and issued free to estates on request (H. L. Munasinghe).

Fungicides :

Fungicides for Bark Rot Control : Two new fungicides with the trade names 'Cerano N' and 'Pantox' were tested as panel fungicides. 'Cerano N' is an organo-mercurial fungicide, containing 0·3% phenyl mercuric nitrate as the active ingredient. It has a paint-like consistency, much like 'Kankerdood' and like it could be used as a waterproof panel dressing. 'Cerano N' was found to be toxic to *P. meadii* as well as the bark of the rubber tree. Phytotoxic symptoms were observed after only one application of 'Cerano N' to rubber bark. The manufacturers were informed about this drawback in the fungicide and they agreed to alter its composition. They have now submitted another formulation containing a lower percentage of the active ingredient. This material is being tested at present.

'Pantox', the other fungicide tested, proved to be non-toxic to *P. meadii* when used neat in the contact method (Peries, Sivapalan and Dantanarayana, 1962). In preliminary studies 'Pantox' was found to be non-toxic to *Hevea* bark ; however, this study was not pursued, as the material is not useful because it lacks fungicidal properties. The manufacturers should reformulate this material enhancing its toxicity to fungi and improving its consistency ; as it is difficult to apply it to tapping panels in its present form (O. S. Peries and D. M. Dantanarayana).

Fungicides for Root Disease Control : The studies commenced with 'Fomac 2' in 1965 were continued during 1966. 'Fomac 2' is a fungicide based on Pentachloronitrobenzene (PCNB), and it is used extensively in Malaya to protect the collar and short lengths of the main laterals from infection by *Fomes*. It is rather important to understand clearly that 'Fomac 2' is not recommended for use as a fungicide to control the disease on infected roots, but rather as a protectant to prevent the infection of healthy roots. The real value of this material lies in the fact that it lasts for long periods in the soil. The Rubber Research Institute of Malaya has found that the activity of 'Fomac 2' lasts for over 2 years in the soil ; during this period any food bases infected by *Fomes*, and lying within the reach of collar protected trees, can be expected to decay at least to such an extent that they no longer present a threat to the treated trees.

Studies carried out at Dartonfield have clearly demonstrated that, when roots of rubber trees are treated with ' Fomac 2,' they resist infection by *Fomes*, even when quite large blocks of wood, infected with this fungus, are buried in close proximity to the protected roots, whereas heavy infection occurred in the case of untreated roots. In a number of instances of artificial inoculation it was observed that the epiphytic growth of the fungus (*F. lignosus*) on the root surfaces had stopped sharp at the point of application of the protectant fungicide, whereas the fungus grew freely over non-protected roots. This result is in close agreement with that of Fox's (1966) and the significance of it is that, *F. lignosus* infects the root invariably through the epiphytic mycelium causing repeated penetrations of the bark from the surface. Therefore, as John (1959) has shown, if the superficial growth of the mycelium is prevented, then infection of the root is naturally obviated. This is the basis of the action of ' Fomac 2,' and hence its use as a collar protectant, and not a fungicide to control the disease in infected roots (O. S. Peries and S. K. Samaraweera).

Soil Microbiology :

Soil Amendments and Root Diseases : Pot experiments were carried out to compare the effect of the addition of organo-mercurial fungicides with that of sulphur to the soil on the infection of rubber roots with *Fomes*.

In these experiments sulphur and ' Tillex,' an organo-mercurial fungicide, were used at three levels each and compared with an untreated control. The method adopted consisted in the use of pots of the same capacity, containing approximately the same quantity of mixed earth, taken from a common heap. Six pots were used for each treatment and six for the control. A piece of *Fomes*-infected rubber wood, of standard weight, was buried in the soil and a budded stump planted in each pot. For the ' Tillex ' treatments, one gallon of the appropriately diluted material was poured slowly over the surface of the soil after planting. In the sulphur treatments the weighed quantity of sulphur dust was first mixed thoroughly with the soil and 1 gallon of water poured over the surface of the soil after planting the budded stump. The control pots were merely watered with 1 gallon of water. After these treatments were completed, all pots were adequately labelled and placed on the ground in rows in a statistically randomized arrangement.

The results were recorded at the end of 1 year, by emptying all pots and observing the state of the food bases and the budded stumps. Table III gives a summary of the results.

TABLE III

EFFECT OF TREATMENT OF SOIL WITH SULPHUR AND TILLEX ON FOMES INFECTION

Treatment	Average pH		No. of plants treated	No. infected	No. not infected
	Start	End			
Tillex 1%	5·1	5·4	5*	4	1
Tillex 2·5%	5·0	5·1	6	3	3
Tillex 5%	5·4	5·6	6	2	4
Sulphur 4 oz/pot	5·3	3·9	6	2	4
Sulphur 8 oz/pot	5·1	3·6	6	1	5
Sulphur 16 oz/pot	5·2	3·3	6	0	6
Control	5·2	5·4	6	5	1

* One pot broke some months after the experiment was started.

This experiment has indicated that soil treatment with sulphur can reduce the incidence of *Fomes* to a great extent, the effect of 16 oz. sulphur per pot being considerably better than all other treatments (O. S. Peries and S. K. Samaraweera).

Soil Microflora and Soil Amendment : The soils from the above pot experiment were studied to define the soil microflora under each treatment tested, to establish whether the materials added to the soil cause a change in the type and/or distribution of soil micro-organisms, which can be correlated with the changes in the incidence of the disease.

It was found that sulphur suppresses the growth of all fungi except *Trichoderma viride*, which was found to be the predominant fungus in the sulphur-treated soil at the end of the experiment. It must be noted that *T. viride* has been found to be an antagonist to the growth of *Fomes annosus*, and *Armillaria mellea* (Garrett, 1956), two major root disease fungi in other parts of the world. It appears now that the mode of action of sulphur in the soil is that it encourages the growth of *T. viride*, which prefers an acid medium for growth, and this fungus suppresses the growth of *F. lignosus*.

Tillex, when applied to the soil, suppresses the growth of all fungi, the effect increasing with the concentration used. But it does not have a selective effect like sulphur. The suppression too is rather short lived, and at the end of approximately three months the normal soil microflora pattern was re-established in the soil treated with Tillex. This confirms the fact that mercurial fungicides are rapidly inactivated in the soil as they are held by chelate bonds by soil organic matter (O. S. Peries and H. L. Munasinghe).

Soil Microbiology and Root Diseases : Studies on the distribution of fungi in rubber-growing soils were continued, and the fungi associated with healthy and *Fomes*-infected rubber roots are being studied. A refined technique has been developed for the isolation of soil fungi, and this will be described in a paper which will be written on this subject in due course (H. L. Munasinghe).

Soil Microbiology and Coconut Leaf Scorch : The soil from the immediate vicinity of healthy and diseased trees was examined, by the technique referred to above, to establish whether there were any differences between the type and distribution of fungi associated with these two categories of trees. It was found that the fungal population in the soil in the immediate vicinity of the roots of diseased palms consisted predominantly of *Fusarium* spp., with very few other fungi being represented. The soil around healthy trees, in contrast, lose a large number of fungi, belonging to different species of many genera.

Small-scale inoculation experiments were carried out to establish whether any of the fungi isolated from the soil around infected plants were pathogenic to roots of coconut seedlings. No lesions were produced, at the end of six months, on inoculated roots (O. S. Peries and H. L. Munasinghe).

Green House :

The proposed experiments under this heading were not carried out during the year, because of the lack of green house facilities.

Leaf Diseases

Oidium Leaf Disease :

General : Wintering took place comparatively early, during a period of unusually hot weather with little or no rain, with the result that the incidence of *Oidium* was extremely low up to the end of April. Light showers of rain fell in late March and with the resultant lowering in temperature and increase in humidity, rubber flowers became infected with *Oidium*, causing a considerable amount of flower drop. This had a significant effect on the industry as pod set was greatly reduced, thus affecting *Phytophthora* leaf-fall, which will be referred to later in this review.

Phytophthora Leaf-fall :

General : The weather was unusually dry (see Table IV) and sunny during June and July, 1966, with the result that little *Phytophthora* leaf-fall occurred during these months. These abnormal weather conditions resulted in pods drying early this year, and seed-fall commenced in the first week of July as compared to normal years when seed-fall begins about the second week of August, generally. Weather conditions became suitable for the propagation of *Phytophthora* spp. during the last 10 days of September and the first week of October, but very little leaf-fall was caused by *Phytophthora* infection, for reasons discussed earlier in this review, under "*Epidemiology* of *Phytophthora leaf disease.*" This is further evidence to prove the dependence of the causal fungus on pods for the production of sufficient inoculum to cause leaf-fall in epidemic proportions.

TABLE IV

RAINFALL RECORDED ON DARTONFIELD GROUP, MAY TO SEPTEMBER 1966, 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	1966	5 yr. av.	1959	1966	5 yr. av.	1959	1966
May	18·66	16·08	4·82	19·10	18·53	8·44	20·22	18·22	5·97
June	15·94	28·30	10·31	16·80	32·71	9·59	19·11	34·40	10·57
July	12·61	12·79	8·90	11·72	15·52	8·21	12·13	14·90	8·45
August	9·98	14·59	14·80	10·16	16·93	11·19	13·66	16·75	14·50
September	12·07	19·16	25·90	12·22	18·10	22·31	13·22	22·07	29·78

Gloeosporium Leaf Disease :

General : The incidence of *Gloeosporium* leaf disease was low throughout the year. There is a widespread opinion amongst planters that the incidence of *Gloeosporium* leaf disease is negligible at present. Therefore, a questionnaire was circulated amongst estates, so as to assess the current status of this disease in Ceylon, in order to establish whether further research on the methods of controlling it were warranted.

Bark and Stem Diseases

Bark Rot :

General : The incidence of Bark Rot was generally low during 1966 too, except in cases where the two basic requirements for keeping disease incidence low, *viz.* (i) the prohibition of the tapping of wet trees and (ii) the eradication of infection at its earliest stages, were neglected. The importance of these two factors in keeping the disease under control has been amply demonstrated in the past, and confirmed this year too.

Field Experiments : Five long-term field experiments, started in previous years, were continued during 1966. The incidence of Bark Rot was extremely low in a majority of the experimental areas, however, a brief review of each experiment is given below for purposes of record.

Experiment 1.—This experiment is being carried out on clone PB 86 at Malaboda Estate, Matugama. It is designed to test three water-miscible fungicides at four levels of concentration, to establish the lowest effective concentration of each. The incidence of the disease was extremely low in all plots including the control, and there were no significant differences between treatments.

This is an interesting experiment, as it is sited in an area where the incidence of Bark Rot was very high prior to 1962, when the Institute started using it for Bark Rot experiments. All Bark Rot-infected trees were treated, to eradicate the disease, before the commencement of the experiment, and since then the Superintendent of the estate has given the Institute his full co-operation by prohibiting the tapping of wet trees, and we have taken every precaution to eradicate the disease from all infected trees, as soon as it is detected. The incidence of the disease has been extremely low in this area since 1963, and it is worthy of record that no water-proof fungicide has been used in this field experimental area since 1963 (T. M. Fernando and D. M. Dantanarayana).

Experiment 2.—This experiment was carried out at Ellakande Estate, on clone PB 86. It was a split-plot experiment to compare the efficacy of three water-miscible fungicides on the main plots and that of two water-proof panel dressings in the sub-plots. Unfortunately, during the year, the estate changed its tapping policy, and altered the tapping task per tapper. This caused a considerable variation in the tree numbers per plot in the original experimental area. However, the experiment was continued for the purpose of observation.

Statistical analyses have shown that the variation between blocks is significant. Therefore, no valid conclusions can be drawn from this experiment, except the indication during the year that there were no large differences, in the incidence of disease, between treatments. It is rather important that this experiment be continued ; but as the tree numbers per plot vary significantly at present, it is essential to lay out the experiment again, equalizing the number of trees per plot and making the necessary adjustments to the tapping tasks with the co-operation of the management of the estate (E. G. Mendis).

Experiment 3.—This experiment was carried out to compare the efficacy of Antimucin with that of Izal for the control of Bark Rot on the fairly tolerant clone Wagga 6278. Four levels of each fungicide was tested in comparison with an untreated control.

A freak storm in the middle of the year knocked down practically all the trees in three plots and caused so much damage to the rest of the experimental area that the experiment was continued merely for purposes of observation. The incidence of the disease was extremely low in all areas including the control ; however, no conclusions can be drawn from this experiment.

It is rather important to establish the lowest concentration of different fungicides that can be used to control Bark Rot in susceptible and resistant clones. Therefore, it would be useful to redesign this experiment, readjust the plot sizes and tapping blocks and then continue this experiment, with a smaller number of treatments, which will still give statistically significant results (T. M. Fernando).

Experiment 4.—This was exactly the same type of experiment as the above, but this time comparing Antimucin with Brunolinum Plantarium on clone Gl 1, at Siriniwasa Estate, Waga.

The incidence of the disease was extremely low in all areas, including the control, and no significant results were obtained from this experiment (W. C. Dayaratne).

Experiment 5.—The main purpose of this experiment was to establish whether water-proof panel dressings are essential for the control of Bark Rot. The experiment was carried out at Dalkeith Estate, Latpandura, on clone PR 107, which is extremely susceptible to the disease. Both panels, on a majority of trees, were infected by the fungus at the start of the experiment, and although the current year's tapping panel on which the experiment was carried out was scraped out for eradicating the disease, the constant reinfection of the tapping panel, by inoculum from the opposite panel, interferred with the experiment. Therefore, the incidence of the disease was comparatively high in all plots, and the results of the experiment did not show any statistical differences between treatments.

The results of this experiment were quite useful from another point of view, however. It gave a clear illustration of the fact that it is essential to eradicate the disease from infected trees, otherwise no combination of water-miscible and water-proof fungicides, now available in the market will successfully control the disease, because of constant re-inoculation of the panels.

It is important to carry out one or more experiments of this nature in the next few years, as it is essential to establish whether water-proof panel dressings serve any useful purpose in Bark Rot control. The indications at present are that these materials do not serve any useful purpose (Peries, 1965), and a number of experimental areas on which no water-proof dressings have been used for over 3 years have not shown any adverse effects up to the end of 1966 (E. G. Mendis).

Effect of Tapping Panel Fungicides on Yield : The results of 2 years experimental work were analysed, and it was found that there were no significant differences in yield between trees treated with Antimucin, Brunolinum Plantarium, ' Fylomac 90 ', or Izal for long periods. However, the results of these experiments should be confirmed by further studies on the same subject, because it is extremely difficult to obtain critical data on yield due to the number of variable factors that have to be controlled. The most important of these factors can be considered to be the tapping variation itself, because of basic differences between the efficiency of tappers. Therefore, it is felt that a far more critical assessment of this subject is necessary with much closer supervision being given to all aspects of tapping, collecting, weighing and application of fungicides (O.S. Peries, S.K. Samaraweera and Z.E. Irugalbandara).

Pink Disease :

General : The incidence of this disease was negligible during 1966, and there were no references made to the Institute regarding it during the period under review.

ROOT DISEASES

White Root Disease :

General : The incidence of the disease was apparently low during 1966, considering the references made to the Institute on this subject.

Effect of Treatment of Soil with Sulphur on Disease Incidence—(Experiment 9): The results of the root disease survey carried out in September, 1966, are tabulated below :—

TABLE V

NUMBER OF TREES INFECTED WITH FOMES IN PLOTS TREATED WITH SULPHUR AND IN CONTROLS

Plot Nos.	Treatment	No. of trees infected by *Fomes*	Percentage infection	No. of trees dead through other causes	Total losses
1	A	15	7·5	8	23
6	A	14	7	5	19
12	A	27	13·5	4	31
18	A	29	14·5	3	32
22	A	15	7·5	3	18
24	A	17	8·5	4	21
3	C	41	20·5	15	56
8	C	38	19	9	47
10	C	47	23·5	12	59
16	C	53	26·5	8	61
19	C	28	14	13	41
20	C	32	16	6	38
2	B	18	9	9	27
5	B	64	32	4	68
13	B	42	21	5	47
14	B	47	23·5	12	59
17	B	39	19·5	6	45
23	B	20	10	2	22
4	D	17	8·5	12	29
7	D	21	10·5	12	33
9	D	19	9·5	18	37
11	D	15	7·5	6	21
15	D	26	13	11	37
21	D	8	4	4	12

Treatments : A — Sulphur treated } Collar examination
C — No sulphur }
B — No sulphur } Leaf symptoms
D — Sulphur treated }

The number of trees infected with *Fomes* is significantly lower in the sulphur-treated plots than the others at present. A proportion of the vacancies in all blocks were supplied in October, 1966 with stumped buddings, so as to ensure an equitable distribution of trees over the whole clearing, with no wide gaps in the stand which may act as hazards for wind damage in the future. The stumped buddings used were originally planted in trenches in low-lying areas of the clearing, at the same time as the main stand, but manured at 3-months intervals so as to stimulate growth. At the end of December these supplies were growing remarkably well, and it now appears that they will keep pace in growth with the original stand. This is a vital part of this experiment, to establish whether vacancies in replanted areas can be successfully supplied with stumped buddings, originally planted at the same time as the normal stand, but stimulated to grow faster with extra doses of manure. If this proves a feasible proposition, as it appears it will do on present evidence, it would be possible to use *Fomes* deaths as a method of thinning out, and supply the vacancies with stumped buddings, where necessary, to obtain a uniform stand without any major wind gaps, as suggested by Peries (1965).

The incidence of *Fomes* in this experimental area should be carefully assessed in the next two years, so as to establish the effect of soil treatment with sulphur on the control of this disease. This method appears attractive on the basis of the results available at present (O. S. Peries and S. K. Samaraweera).

Methods of Identification and Treatment of Fomes—(Experiments 6, 7 and 8) : Three experiments were carried out on this subject in the 1961 replanted areas at Dartonfield. The main purpose of the experiment was to compare the method of tree to tree collar examination with that of leaf symptom assessment for the identification of *Fomes*-infected trees in young replanted areas. An assessment of disease incidence was carried out in these areas in August-September, 1966, and the final results of this experiment can be based on the data available now, as the incidence of *Fomes* in these areas is not likely to be significant in the future, now that the trees are 5 years old, it being a well established fact that the incidence of *Fomes* is of significance in newly replanted areas only during the first four years of their growth. The results of these experiments have shown that :—

(1) The total incidence of *Fomes* was consistently higher in areas where collar examination was carried out than in those where the disease was identified on the basis of leaf symptoms.

(2) The general pattern of *Fomes* incidence differed considerably according to the method of identification adopted. Where collar examination was carried out, the incidence of the disease was high during the first two years and it tailed off sharply thereafter ; but when the disease was identified on the basis of leaf symptoms the incidence was low during the first year, reached a peak in the end of the second year and tailed off gradually thereafter.

(3) The disease occurred in patches whichever method of identification was carried out, confirming once again the importance of the food base in *Fomes* infection.

(4) The percentage success in the treatment of infected trees was considerably higher in cases where the disease was identified by collar examination than by leaf symptoms. However, as stated in (1) above, the total incidence was higher in the former method of identification and the higher rate of success of treatment did not compensate for this factor. Therefore, the final stand would generally be higher in areas where disease identification is based on leaf symptoms, if other factors, such as replacement of dead trees, are equal.

(5) It was confirmed that Brown Root disease infection was normally indentifiable at a later stage of infection than White Root, and that when identified this disease has usually developed to such an extent that the infected tree cannot be saved by surgical or other treatment. Therefore, infection by Brown Root disease generally resulted in the loss of the tree, unlike in White Root, where a high percentage of trees can be successfully treated.

(6) The method of collar examination costs considerably more than the other, as more labour is required for identifying the disease.

It can be concluded from these experiments that, when all factors are taken into account, the most economical method of identifying *Fomes* infection is by carrying out 6-monthly rounds of leaf examinations. When diseased trees are identified by this method, they can be considered foci of infection, and the neighbouring trees, on either side, should then be collar examined to establish whether they are infected. These can then be successfully treated, if infected, and their collars protected with 'Fomac 2' to prevent re-infection (O. S. Peries and S. K. Samaraweera).

Methods of clearing and incidence of Fomes — (Experiment 23) : Work was started on Glenesk Estate, Puwakpitiya, on this experiment, which is designed to assess the possibility of retaining the timber from the previous stand on the site, and the implications of this procedure, on the incidence of *Fomes* in the replanted area. This is an extremely important experiment, because if the timber can be kept on the site without increasing the risk of *Fomes* infection, it will not only help to provide considerable amounts of N, P, K to the soil but will add large quantities of organic matter to it. The latter is a very significant factor, as tropical soils are generally deficient in organic matter and any method of adding it to the soil is worthy of exploitation (O. S. Peries and S. K. Samaraweera).

Susceptibility of Various Root Stocks to Fomes : The nursery that was planted soon after the 1965 seed-fall had seedlings on of 12 clones in it, at the beginning of 1966. This nursery was extended after the 1966 seed-fall. The importance of assessing the relative susceptibility of different clonal seedlings to *Fomes*, and checking on various other characteristics of these clones for suitability as seedling stocks is becoming more apparent now ; as the areas planted with clone Tjir I are rapidly being uprooted and replanted, and it may be difficult to obtain sufficient seeds of this clone for the full replanting requirements of this country in the near future. (O. S. Peries and S. K. Samaraweera).

Small-scale Field Trials

Hirst Spore Trap :

The studies on fungal spore distribution in the atmosphere in rubber-growing areas were continued. The Hirst spore trap recorded only an occasional *Oidium* spore until late March. This showed a close relationship with the low incidence of *Oidium* leaf disease in most rubber-growing areas in Ceylon during the first three months of the year. Only a limited amount of work was done on this subject from the beginning of April till November, 1966, as the officer carrying out this study was on leave overseas during this period. However, sufficient slides were prepared at regular intervals throughout the year to help maintain the continuity of this work, and this study is now being continued (O. S. Peries and T. M. Fernando).

Bark Cracking :

The budgrafts made from infected and healthy trees were kept under observation throughout the year. Bark cracking symptoms were observed on a high percentage of trees growing from bud patches taken from infected trees, whereas none of the trees grown from healthy buds have shown any of these symptoms (O. S. Peries).

Incidence of Bark Root :

The bark of PB 86 trees was inoculated at frequent intervals with cultures of *P. meadii* and *P. palmivora*, under varying conditions of weather, in order to establish (*a*) the relationship between weather and incidence of Bark Rot and (*b*) whether both these species of *Phytophthora* are pathogenic to *Hevea* bark.

The results available up to the end of December, 1966 have shown that both *P. meadii* and *P. palmivora* can cause lesions in *Hevea* bark when inoculated in the standard manner. However, the infections caused by *P. meadii* appear to grow more rapidly than those produced by *P. palmivora*, which also gives rise to a much darker coloured lesion.

The studies carried out in 1966 have confirmed the results of those conducted in 1965, in so far as the relationship between weather and the disease is concerned. Infection and lesion development is apparently not dependant on weather conditions, at least at the initial stages of the disease. However, from field observations, there is every reason to believe that the fungus grows rapidly during wet weather periods and hibernates during extremely hot dry weather. This may occur sometime after infection has occurred, and this aspect of Bark Rot development needs further investigation. However, it is quite clear now that infection of the panel can occur at any time of the year, although the lesion may not develop rapidly in dry weather periods. Therefore, the warning that tapping should under no condition be carried out on wet trees must be heeded.

Agricultural Engineering Section

General :

Advisory Work : All advice on spraying and dusting, and on machinery to be used for these purposes, was based on studies carried out in this section.

Leaf Disease Control :

Oidium leaf disease : Seven randomized block experiments (Field Experiments Nos. 10 to 16, inclusive) were carried out during the year. All these experiments are long-term experiments, designed to establish the effects of various treatments, carried out to control *Oidium* leaf disease over a period of years, on the yield and general growth of the tree. The details regarding the experimental layouts and the treatments carried out on all seven experiments are given in the Annual Review for 1965 (Peries 1966).

The incidence of *Oidium* leaf disease was so low during the refoliation season of 1966, that little or no leaf-fall occurred on all experimental areas. A maximum of only 2-3 rounds of sulphur dusting was carried out on any of the experimental plots, a large number of them were not treated at all ; as the incidence of the disease was negligible. The nett result of this was that none of the *Oidium* control experiments showed significant differences in leaf-fall between treated and untreated plots (D. L. S. Wimalajeewa, E. G. Mendis, T. M. Fernando, S. K. Samaraweera and W. C. Dayaratne).

Phytophthora Leaf Disease: Six field experiments (Field Experiments Nos. 11, 14, 19, 20, 21 and 22) were carried out during the *Phytophthora* season (South West monsoon period). Two of these were combined *Oidium* and *Phytophthora* control experiments (Nos. 11 and 14), the next two were essentially formulation assessment trials, comparing dusting and spraying materials, and the last two were designed to establish the optimum swath width for copper dusting.

Just as in the case of *Oidium*, the incidence of *Phytophthora* leaf disease was so mild in 1966 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 4 gives the rainfall figures for the months May to September (inclusive) 1966 at the three Divisions of the R.R.I.C. Estate. This Table shows that, just as in 1964 and 1965, June and July were dry months in 1966 too, as compared to the rainfall recorded during these months in 1959, which is recognized as a bad *Phytophthora* year. It is clear now that the rainfall and general weather conditions, prevailing mainly in June, are the essential factors that govern the severity of *Phytophthora* leaf disease incidence in Ceylon. This has been observed over a number of years now, and is confirmed by the fact that although weather conditions may become suitable for the propagation of the causal fungus later in the year, after August, the disease does not cause severe damage. This type of weather pattern and the correlated disease incidence has occurred in the 3 consecutive years 1964, 1965 and 1966. The factors contributing to this pattern of disease incidence have been discussed in detail in this reviews under the heading — '*Epidemiology*' (O. S. Peries, E. G. Mendis, W. C. Dayaratne, T. Shanmuganathan and D. A. Jayasekera).

Gloeosporium Leaf Disease: 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 given routine attention, such as weeding and manuring during the period under review. The incidence of the disease was extremely low in this area during the year ; therefore, no measures were taken to control it this year (O. S. Peries and T. Shanmuganathan).

Other Field Trials :

Leaf Surface Wetness Recorder : This apparatus was operated from time to time throughout the year in an attempt to establish the relationship between leaf surface wetness and disease incidence. The results available from studies carried out during the last two years have confirmed laboratory findings that long periods of leaf surface wetness are inimical to *Oidium* leaf disease but ideally suitable for *Phytophthora* leaf disease. The indications are that rubber leaves should be wet for continuous periods of 48 hours or more, with every short dry periods if at all, for heavy *Phytophthora* leaf-fall to occur even on individual trees. This is an important observation, because laboratory studies (Peries, 1964) have shown that leaf petioles are infected when kept wet for much shorter periods under humid conditions (O. S. Peries and H. L. Munasinghe).

Formulation Assessments

Fungicides for Phytophthora Leaf Disease Control : The results of the studies carried out on this subject have been presented in a paper entitled : ' Studies on copper fungicides. 1. Biological efficacy of copper spray deposits containing various ' stickers,' for publication in the Quarterly Journal of the Institute (O. S. Peries and W. C. Dayaratne).

Efficacy of Fungicides : Small-scale field trials were carried out to test the toxicity of various organo-mercurial fungicides for the control of *Gloeosporium* leaf disease or for the prevention of *Gloeosporium* infection. It has been confirmed that organo-mercurial fungicides, at concentrations highly toxic to *Gloeosporium* spores, can be sprayed with complete safety on rubber leaves just after bud-break. These studies should be continued, if it becomes necessary to reinvestigate the problem of *Gloeosporium* leaf disease control in *Hevea*. The present indications are that the incidence of this disease is low in the rubber-growing districts of Ceylon (O. S. Peries and W. C. Dayaratne).

Machinery and Application

Testing of Spraying Machines : The laboratory work in connection with the testing of two spraying machines was carried out during the year. Rubber leaves and glass slides were analysed and examined, after spray treatment at different heights on a mast, to define the following characteristics of the machines — (*a*) vertical range of spray, (*b*) droplet size, (*c*) output, (*d*) recovery, and (*e*) spread.

The firms supplying the machines were invited to discuss the performance of their machines in detail with the Institute. At these discussions various suggestions were made to the firms for improving the performance of their machines (O. S. Peries, D. L. S. Wimalajeewa, E. G. Mendis, W. C. Dayaratne and T. Shanmuganathan).

Field Surveys

Leaf Disease Surveys :

Gloeosporium Questionnaire : By the end of 1965, a majority of rubber planters were of the opinion that the incidence of *Gloeosporium* leaf disease was rather low. Therefore, a questionnaire was circulated amongst estates with a view to assessing the present status of the disease in Ceylon, in relation to the need for further development of control measures.

The response to the questionnaire was rather poor, only 61 replies being received. The general consensus of opinion amongst planters appears to be that the incidence of the disease is low at present and not causing them any concern. However, as the replies to the questionnaire were not representative of a fair cross section of rubber planters, a detailed analysis of the replies was not undertaken (O. S. Peries, D. L. S. Wimalajeewa and T. Shanmuganathan).

Oidium and Phytophthora Leaf Disease Questionnaires : These questionnaires were distributed to estates through their Agency Houses, and the replies were carefully analysed. Here again, as in the case of the *Gloeosporium* questionnaire, discussed above, the response was extremely poor, under 75 replies being received in each case. It has now come to a point where a realistic assessment must be made of the value of these questionnaires. The Institute is sending out more and more questionnaires on various aspects of rubber planting and the response is bound to become poorer with time. Even when replies are available, it is rather difficult to assess the results as the data provided is subjective. Therefore, it appears that it would be more useful to obtain any data from estates by sending out members of the Institute's staff to carry out the surveys. The results of such surveys would naturally be less representative, but they will be objective and consistant, and if the estates to be surveyed are carfefully selected, a true representative sample can be visited and the results carefully analysed to provide valuable information. This was successfully done in the case of the *Gloeosporium* survey carried out in 1962–63 by Wimalajeewa (1963) (O. S. Peries and E. G. Mendis).

INDEX TO FIELD EXPERIMENTS

REVIEW OF THE SOILS CHEMISTRY DEPARTMENT

By

A. J. JEEVARATNAM

SUMMARY

RESEARCH FINDINGS—MINERAL NUTRITION

Response to Fertilizer Applications :

Results obtained from the field trial that has been in progress for a period of fourteen years have provided the experimental evidence necessary for expressing the opinion, that applications of NPK fertilizers at rates presently recommended by the Institute to clonal rubber during the immature as well as during the early years of the productive phase would result in increased yields that are likely to prove economically worthwhile even under conditions of an assumed unfavourable cost-price situation. (The unfavourable cost-price situation assumed being a 20% fall in price, from the discounted average for RSS No. 1 in 1963 and a 20% rise in fertilizer costs as on 1st July, 1964).

This finding is of great practical significance from the point of view of the rubber producing industry, in that it provides definite experimental evidence that will dispel any doubts in the minds of the producers as to the economic significance of the practical benefits to be derived by continued applications of fertilizers to rubber in the productive phase.

Apart from this, several other useful indications have been obtained — the yield increases (mean of four clonal materials viz. PB 86, PB 86 crown-budded with LCB 870, LCB 870 and AVROS 255) recorded under the relevant treatments in 1966 being as follows :—

Yield increases in grammes per tree per tapping—1966

	Mature phase		Increase
	0	NPK	
Immature phase			
0	0·6	6·6	+ 6·0
NPK	7·2	14·1	+ 6·9
Increase	+ 6·6	+ 7·5	+13·5

1. The increase in yield resulting from the application of the NPK mixture during the immature as well as the mature phase, compared to the yield obtained from the treatment where no fertilizers were applied at any time, was of the order of 13·5 grammes per tree per tapping.

Assuming a stand of 140 trees to the acre and 140 tappings on the S/2, d/2 100% system per year the yield increase is equivalent to about 600 lb per acre, in the seventh year of tapping.

2. Though there was evidence to believe that about 50% of this increase should still be attributed to the beneficial effects of applying the NPK fertilizer mixture during the immature phase, the percentage increase that could be attributed to fertilizer application during the mature phase was on the increase.

3. There was definite evidence of the fact that beneficial response of this nature to application of fertilizers during the mature phase can be obtained only from rubber plants that have received balanced nutrition during the immature phase.

4. Indications 2 and 3 described above serve to focus attention on the degree with which the importance of applying properly balanced fertilizer mixtures during the immature phase should be emphasized in all replantings.

This alone could determine the ability of rubber producers to withstand the cost-price squeeze in years to come.

The results from the same experiment have given preliminary indications of the following possibilities as well :—

1. While the application of the complete NPK mixture during the immature and mature phases has given the best response in terms of yield, the positive interaction of nitrogen and potassium would appear to be of greater importance during the mature phase.

2. Rubber trees that have not received any fertilizer application during the immature phase have generally responded better to application of phosphate only, at least for a few years than to applications of mixtures of N, P and K.

Optimum Levels of Nitrogen, Phosphorus, Potassium and Magnesium :

The several trials that have been in progress to determine the optimum levels of each of the above nutrients on different clonal materials and under different conditions have given varied results.

The general trend has been that hardly any significant responses have so far been observed to applications of higher levels of each of the four nutrients compared to the levels presently recommended by the Institute.

The trial laid down in 1963 to determine whether the more vigorous clones that have been recommended for large-scale planting in recent years such as RRIC 45 and RRIC 52 would benefit from higher levels of fertilizer applications has given some indication to the effect that application of a NPK+Mg fertilizer mixture at higher rates will not increase the rate of growth of the more vigorous materials any more than it would of the control clone PB 86.

Significant growth increases have been observed on the four clonal materials PB 86, RRIC 7, RRIC 45 and RRIC 52 at three to six times the normal rates of application, though the increases were of the order of only 0·4″ to 1·0″ of girth per tree at the end of the third year of growth.

It must be emphasized that while it is yet too early to draw any useful conclusions from the results of this experiment, the results so far obtained have to be interpreted with great caution in the light of the large variation in the growth of the plants in this replanting resulting from the high incidence of *Fomes* encountered in the experimental area.

Response to the Application of Fertilizer Requirements in the Form of one or More Inorganic Fertilizers as Estimated by Foliar Analysis Compared to the Response to Application of Standard NPK+Mg Fertilizer Mixtures :

There were five trials in this series in progress—two of which were started on rubber during the immature phase and three on rubber in the mature phase.

The longest period any of these trials have been in progress is six years. No significant differences in growth or yield have thus far been recorded.

The only useful indication observed in 1966, is the improvement in the trend of better growth on clone PB 86 receiving fertilizer applications according to foliar analysis where the differential treatments have been applied from the time of planting. The increased growth at the end of six years was of the order of 0·5″ per tree. Though this increase has not yet reached the stage of being statistically significant, the practical significance of this observation lies in the fact that this increase has been recorded with lesser expenditure in fertilizers.

Suitability of Fertilizer Materials Available in Ceylon or likely to be Produced in Ceylon for Supplying the Nutrient Requirements of Rubber :

(1) Dolomite

In two field experiments in progress to study the incidence of magnesium deficiency on clone PB 86, (a clone known to exhibit magnesium deficiency symptoms more readily than others) and growth response to application of magnesium requirements as crushed dolomite quarried in Ceylon and the growth response to application of magnesium in the form of imported magnesium containing fertilizers such as commercial epsom salts and kieserite, no significant difference in the incidence of the deficiency or growth of the plants have thus far been recorded.

There has been no evidence of a depressing effect on growth recorded during the five years the trials have been in progress.

If at all, there has been a trend, it has been in favour of dolomite.

(2) Urea

The results obtained in respect of nitrogenous fertilizer, urea has been of the same nature as reported for Dolomite.

Response to Improved Fertilizer Materials :

In a trial laid down to study the response to one brand of granular compound fertilizer, and two brands of granular concentrated compound fertilizers as against the standard mixture of inorganic fertilizers, a significant beneficial response in growth of the order of 1″ of girth per tree has been recorded in the fifth year of growth in favour of all three brands of the granular compound fertilizers.

Investigation on Wind Damage

(*a*) The results of a count of the three types of damage viz. uprooting, trunk snapping and branch breakage, that occurred during a freak storm over an experimental area of clone LCB 1320 (a clone known to be particularly susceptible to wind damage), which had been specially laid down to study the effect of reduced levels of N, P and K on the incidence of wind damage, failed to show any significant differences in losses due to treatment differences.

The whole of the experimental area suffered a 20% loss during the freak storm.

(*b*) Surveys of wind damage losses carried out in experimental areas of two to three year old replantings of clones RRIC 45, RRIC 52, PB 86 and RRIC 7 would seem to indicate that clone RRIC 52 is more susceptible to wind damage losses during the early years compared to the other clones in the trials.

Cultivation Practices, Ground Covers and Weed Control

(*a*) Mulching

(1) *Pueraria* loppings

In the four trials that have been in progress to investigate the effect of mulching with loppings of *Pueraria* on the growth of rubber plants during the immature phase, it was observed that the significant beneficial response to cultivation practice observed in earlier years, was not evident in 1966.

(2) Guatemala grass loppings

In two of the trials where mulching with Guatemala grass has been carried out for a period of 5 years, the treatment where mulching was carried out with loppings of the grass brought from outside the experimental area during the last two years has shown a beneficial response in growth.

(*b*) Leguminous covers *vs* natural covers

(1) Cultivation of guatemala grass

According to the results recorded in 1966, it would appear that the absence of any beneficial response to the cultivation of Guatemala grass between rubber rows and mulching the planting row with loppings of the grass, recorded in previous years could be attributed to the competition for soil moisture between the rubber plants and the Guatemala grass during periods of moisture stress in the soil.

The planting of Guatemala grass between rubber rows planted 20 ft. apart or less should therefore be discouraged.

(2) No apparent differences have been observed in the growth of seven clones, where a ground cover of *Pueraria* has been maintained according to standard estate practice, compared to the growth of the same clones in an adjoining block where the ground conditions were maintained under natural covers, kept under check by spraying herbicides.

Since this trial has been in progress only for a period of three years it is yet too early to consider this observation even as a safe indication.

(*c*) Weed control

The two new herbicides viz. Tordon 22 K and Tordon 101, tested for effectiveness in eradicating ferns, such as Bracken (Kekilla), *Nephrolepis* spp. and other pernicious weeds such as Illuk, Lantana and stray rubber seedlings have been found to be more effective than the herbicides that have been tested in the past.

This was found to be so even at the lowest concentration at which the two herbicides were applied viz. 1·5 lb per 30 gal. of water.

Soil Surveys

The project of surveying the soils in the rubber-growing areas at a semi-detailed reconnaissance level was completed. Rubber-growing areas covered by the 1" topographical sheets of Ambalangoda, Alutgama, Panadura-Horana, Avissawella, Gampaha, Kurunegala, Kandy, Hatton, and Ratnapura have now been surveyed at this level. A total area of about 2300 sq. miles has been covered.

Observations made in the Course of Specialised Advisory Work

Instances of an unusual form of necrosis encountered in young replantings have been diagnosed as either boron toxicity and/or calcium deficiency. Since the remedial measure for boron toxicity as well as calcium deficiency is the application of lime, and since no dolomite had been applied in all instances where the symptoms were observed, application of dolomite was recommended as the remedial measure.

Follow up investigations carried out in one of the areas seemed to indicate that the application of the remedial treatment recommended has had the desired effect.

Two other instances of deficiency symptoms observed on mature areas, and brought to the notice of the Department were diagnosed as potassium deficiency.

It would appear that one of the primary causes for the incidence of backward growth and/or poor yield reported in rubber plantations, as well the unprecedented occurrence of boron toxicity and/or calcium deficiency symptoms in young replantings, is the degraded nature of the soil conditions resulting from the undue loss of important soil fractions through erosion and leaching, under the intensive precipitations experienced in rubber-growing areas.

The paucity in the adoption of effective soil conservation measures by way of soil conservation earth works at the time of replanting with the object of cutting down cost of replanting operations, and the unrealistic emphasis on the replacement of natural ground covers with a pure stand of leguminous covers even under mature rubber areas, are two factors that have aggravated the deterioration of soil conditions over a period of years.

Unless better standards and stricter controls are insisted on and exercised in regard to the cultivation practices adopted on replantings, not only would the possibility of obtaining increased yields from the improved planting materials recommended for planting now, be more than nullified but also soil conditions can deteriorate to the point of becoming an additional limiting factor in the continued utilization of the limited land resources available for the economic production of natural rubber for export, leave alone the possibility of ever being able to utilize economically, a substantial portion of the areas presently cultivated with rubber for the production of any other crop.

DETAILED REVIEW

GENERAL

Staff :

The Head of the Soils Chemistry Department, Mr. A. J. Jeevaratnam and the Soils Chemist, Mr. C. G. Silva were on duty throughout the year.

Mr. R. S. John, Assistant Soils Chemist, proceeded for post-graduate training at the University of Aberdeen on 29.9.66.

The vacancy for one Field Assistant was filled on 15th July, while the vacancies for two Technical Assistants continued to remain unfilled throughout the year. The vacancy for a Field Attendant that occurred as from 15.9.66 also continued to remain unfilled.

Assistant Staff Changes :

Mr. M. A. Mendis, Field Attendant of the Soils Chemistry Department was appointed as Field Assistant in the same Department with effect from 15.7.66.

Mr. J. T. K. V. Nageswaran, Field Assistant was stationed at the R.R.I.C. Sub-station at Kuruwita with effect from 2nd May 1966.

Staff Training

The two Technical Assistants, Messrs. E. R. Chelliah and F. P. W. Silva, assisting the Soils Chemist in the soil survey work attended a six-week course in air-photo interpretation conducted by Dr. Schmidt Kraepelin, UNESCO expert assigned to the Survey General's Department in May/June 1966. Only one of the Technical Assistants, Mr. E. R. Chelliah followed the two-week advanced course conducted later in the year.

The Soils Chemist participated in this course by addressing the trainees on one occasion and by attending lectures of special interest to him.

The Head of the Soils Department and the Soils Chemist also participated in the one-day field excursion to rubber-growing areas in the Kegalle District.

Visitors

Important visitors to the Department were as follows :—

Mr. L. C. De Mel, Panadura Tea & Rubber Co.	— 23. 1.66
Messrs. C. A. C. Bowen and Denham de Alwis of Dalkeith Group, Lathpandura	— 2. 2.66
Dr. Chai of the Rubber Research Institute of Malaya	— 28. 2.66
Sir Albert F. Peries, Speaker, House of Representatives	— 16. 3.66
A Japanese delegation representing the fertilizer industry in Japan	— 1. 4.66
Mr. J. Young, Proprietor of Glenesk Estate and Superintendent of Elston and Glenesk estates	— 5. 4.66
Directors of Messrs. Carson Cumberbatch & Co. Ltd., Colombo	— 19. 5.66

Dr. G. A. Watson of Plant Protection Ltd. (I.C.I.) U.K. and Mr. J. d'Auzac of Institut Francais du Coautchouc — 1. 6.66

Soils Chemist of the Coconut Research Institute — 6. 6.66

Dr. & Mrs. Schmidt Kraepelin — 31.7. & 1. 8.66

Mr. Ronnie de Mel — Director, Gikianakande Estates Ltd., Messrs. Dias and C. D. de Fonseka — 31. 8.66

Prof. J. E. Blackman of the Department of Agriculture, Oxford and Dr. L. H. Fernando of the Tea Research Institute of Ceylon — 25. 9.66

One of the Directors and the Superintendent of Parambe Group — 15.10.66

Dr. K. C. Sankaranarayanan, Plantation Corporation of Kerala, India — 26.10.66

Meetings, Conferences, Seminars etc.

1. Symposium on rice production organised by the C.A.A.S. 25/4—26/4
2. Rubber Symposium organised by Messrs. Carson Cumberbatch & Co. Ltd., 21/5.
3. Meetings of the Scientific Committee 3/6/66 ; 20/10/66
4. Meetings of the Standing Committee on Agrochemicals 7/3 ; 3/6 ; 29/8 ; 9/11
5. Meetings of District Planters' Association —

   Kalutara 25/9 ; 2/11

   Sabaragamuwa 2/11
6. Symposium organised by the Soil Conservation Society 17/11
7. Annual session of the C.A.A.S. 14/12 to 17/12

Visits

	Advisory	Experimental	Others	Total
Head of Soils	16	17	19	52
Soils Chemist	2	Soil Survey	5	7
Asst. Soils Chemist	—	4	4	8
S.T.A. Soils	—	71	2	73
Technical Assistants	—*	24	1	25
	18	116	31	165

* The field trips done by the Soils Chemist and the 2 Technical Assistants in connexion with the soil survey work and the trips done by Field Assistants in connexion with field experiments are not included.

Correspondence

	Inward	Outward
Technical	573*	273
General	71	42

* Includes returns on wind damage losses from estates.

Reports, Roneoed Leaflets and Papers

(*a*) For restricted circulation —

1. Annual Report of the Soils Chemistry Department for 1965.
2. Report on the possibilities of using urea as a source of nitrogenous fertilizer for rubber.
3. Report on the requirements of ammonium sulphate and urea in 1970.
4. Report on the suitability of the manuring programme followed at Egal-Oya.
5. Progress reports of the Soils Chemistry Department for the 1st, 2nd & 3rd quarters of 1966.
6. Circular letter on survey of wind damage losses.
7. Note on Boron Toxicity in Rubber.

(*b*) For publication (already submitted) :

1. Improved system of planting rubber—by Head, Soils Chemistry Department.
2. Evaluation of the potassium status of some soils encountered in the rubber growing areas of Ceylon—by R. S. John, Assistant Soils Chemist.

In preparation

1. Studies on the soils of rubber lands in Ceylon — Soils Chemist.

(*c*) Publications in 1966

Review of the work of the Soils Chemistry Department for 1965.

Advisory Work

In the execution of the advisory functions of the Department, work of a routine nature involved in the dissemination of generalised recommendations to estates through correspondence and/or visits was gradually taken over by the Estates Advisory Department established at the beginning of the year, after an initial period of on-the-job training.

The responsibility for issuing the generalised recommendations and the execution of advisory work of a specialised nature continued to remain the function of the Soils Chemistry Department.

1. *Generalised Recommendations :*

(*a*) Advisory Circulars — Work on the revision of the advisory circular on manuring and the preparation of two new advisory circulars, one on soil conservation and the other on ground covers and weed control was under way.

(*b*) Demonstrations and training courses

The programme for conducting demonstrations and training courses on the improved system of planting on the contour was suspended pending further discussion and decision by the Board. Instead a paper describing the method was prepared and submitted for publication as suggested.

With a view to gain more experience and to ascertain the difficulties that are likely to be encountered in adopting the system under conditions of different terrain, the system was tried out on a few estate holdings that specifically requested a demonstration.

(*c*) Correspondence on subjects such as weed control, where it has not yet been possible to make generalised recommendations, continued to be handled by the Department.

2. *Specific Recommendations :*

This was confined to problem areas that were brought to the notice of the Department. Wherever necessary, holdings were visited and investigations were carried out before specific remedial recommendations were given.

In this connexion visits were made to rubber holdings, soil and/or leaf samples collected were analysed and reports embodying specific recommendations have been submitted. Results of investigations thus carried out brought to light two instances of potassium deficiency and four instances of calcium deficiency and/or boron toxicity.

3. *Specialised Advisory Service :*

The proposal to provide a specialised advisory service for giving specific recommendations on the manuring and cultivation of planting materials according to location, soil conditions and environment as a routine feature was withheld in the light of the Board's decision that such a service could not be provided by the Institute.

Research Investigations

Investigations aimed at improving estimation of soil and tree nutrient status in determining optimum fertilizer requirements

(*a*) *Detailed Soil Survey of Rubber Holdings and Preparation of Soil Maps*

(*b*) *Detailed Foliar Survey of Areas where Soils have been Surveyed in Detail*

In the light of the Board's decision that a specialised advisory service for purposes of giving specific recommendations on manuring and cultivation of planting material according to location, soil conditions and environment as a routine feature could not be provided by the Institute, work on the above projects was suspended, as it was apparent that the information to be gained by the large volume of work that has to be put in in carrying out these surveys would be only of little practical value.

The soil survey team therefore, concentrated on extending the soil survey at the semi-detailed reconnaissance level to areas that were considered as being marginal for rubber cultivation on the basis of climatic requirements and left out of the survey previously.

The following areas were covered by the survey team, during the year :

Hatton Sheet	...	...	130 sq. miles
Ratnapura Sheet	...	...	200 ,, ,,
Kandy Sheet	...	...	160 ,, ,,
Kurunegala Sheet	...	...	200 ,, ,,

thus completing the major part of the field work involved in surveying a total area of 2,300 sq. miles, the other one-inch sheets covered being Ambalangoda, Alutgama, Panadura-Horana, Avissawella and Gampaha.

Laboratory investigations on soil samples collected during the survey and preparation of landform and soil maps was in progress.

(*c*) *Sampling and Analysis of Leaves From Different Clones and Experimental Areas Receiving Different Fertilizer Treatments*

The following determinations were carried out on leaf samples collected from experimental areas.

Nitrogen	...	...	490
Phosphorus	...	...	497
Potassium	...	...	371
Calcium	...	...	374
Magnesium	...	...	374
Copper	...	...	264
Boron	...	...	21
Manganese	...	...	2

(*d*) *Mineralogical Analysis of Soil Samples*

The mineralogical analysis of the clay, silt and sand fractions separated from four soil samples collected from two profiles of micaceous soil, by X-ray defraction were carried out with the assistance and co-operation of the University of Hawaii. Attempts have been made to interpret the patterns obtained with the help of Drs. F. S. C. P. Kalpage and H. W. Dias of the University of Ceylon, and the minerals present have been identified.

In view of the fact that the apparatus required for mineralogical analysis, available at the Department of Mineralogy and the University of Ceylon being out of order and the charges quoted by a laboratory in Holland for carrying out such analysis being prohibitive, it has not been possible to carry out the mineralogical analysis of fractions separated from other soil samples.

(*e*) *Preliminary Experiments with Radio-Isotopes*

In spite of several efforts, the Assistant Soils Chemist, Mr. R. S. John who underwent a preliminary training in this technique at the Radio-Isotope Centre in Colombo, could not carry out the investigations envisaged under this heading for two reasons :—

1. Lack of proper facilities at the Institute and practical difficulties in making use of facilities available at the radio-isotope centre in Colombo.

2. He was compelled to complete investigations on the evaluation of potassium status of soils and write up the results in the form of a paper suitable for publication before proceeding for overseas training in September 1966.

Methods of Analysis :

The Jeffries method for the removal of free iron oxide from soil and Walkly and Black method for the determination of organic carbon in soil samples were experimented with before adoption.

Response to Fertilizer Applications, Cultivation Treatments and Ground Covers

Field Experiments :

The twenty field experiments that were in progress at the end of 1965 to study the effects of fertilizers, ground covers and cultivation treatments on the growth and/or yield of immature and/or mature rubber were continued in 1966. Each of these trials has now been assigned a number, in consecutive order according to the year in which the trial was commenced.

One new experiment was laid down in 1966, designed to test five levels each of the four nutrients N, P, K and Mg on clone RRIC 45, making use of the latest development in field experimental techniques. This experiment has been assigned No. 21.

The servicing and recording of growth and/or yield data on the 21 field trials in progress was carried out by the three Field Assistants and two Field Attendants under the direction of the Head of the Department.

The volume of field work involved turned out to be unexpectedly heavy during the year. This was due to the fact that it became necessary to make yield assessments by test-tapping on ten out of the 21 field trials in progress in 1966. The increase in the amount of field work involved becomes apparent when compared to the situation that prevailed up to the end of 1965 when yield assessment by test-tapping was confined only to two field trials.

This sudden increase in this type of work was brought about by the decision to carry out yield assessments by test-tapping on trials 6 — 8, 9, 10 & 17 in order to ascertain whether or not yield assessments made on the basis of tappers' intake maintained by commercial estates was satisfactory. This, unfortunately coincided with the year when yield assessments by test-tapping had to be commenced on three other experimental areas that had come into production.

In order to cope with the work involved a certain amount of decentralisation became imperative and one of the Field Assistants was therefore stationed at Kuruwita Sub-station incharge of the five field trials in progress there and the three trials in progress in the Kegalle District.

The volume of yield-recording work on older trials was also cut down by resorting to volume measurements on experimental plots once a month on Field Trial No. 1 instead of recording yields by test-tapping of individual trees twice a month as before and by restricting the number of test-tappings of individual trees in Field Trial No.20, to about ten per year instead of the usual 24.

Under the above circumstances it was not possible to undertake the additional work involved in laying down new field trials envisaged for the year.

Changes in experimental treatments implemented during the year were as follows :—

1. Fertilizer applications according to the treatments were discontinued in Field Trials Nos. 2 & 3 as they were expected to come into production in 1965. This change was implemented in Trial No. 2 as well, inspite of the fact that it was not brought into production as expected.

2. The mulching treatments in Trials Nos. 4 & 5 were discontinued due to the gradual disappearance of ground covers, including Guatemala grass under the shade of the canopy.

Field Experiment No. 1 — Trial of N and K in Presence of P :

The girth measurements recorded in 1965 and yield assessments made on the basis of test-tapping individual trees twice a month in 1965 did not show any significant differences either on the basis of treatments applied during the mature phase or on the basis of treatments applied during the immature phase. The situation continued to remain the same in respect of girth recorded in January 1966. The yield assessments made in 1966, however, showed a significant difference due to treatments for the first time during the seven years fertilizers have been applied during the mature phase.

The mean yield in grammes per tree per tapping recorded in 1966 for the different treatments applied during the mature phase was as follows :—

Treatment	O	P	NP	PK	NPK	Sig. diff. p=5%
Yield	20·4	20·8	20·5	20·3	23·9	1·74

This phenomenon gives scientific support to the indications reported in earlier years that continued manuring of *Hevea* with a complete NPK fertilizer mixture during the mature phase does give a beneficial response in yield.

Though the overall mean increase in yield, according to the conditions of this experiment has been only of the order of 3·0 grammes per tree per tapping, it should be reported that the increase in yield resulting from the application of the NPK mixture during the immature as well as the mature phase, against no manuring, was of the order of 13·5 grammes per tree per tapping — this being a mean of the four clonal materials under trial and is equivalent to about 600 lb per acre per year.

There is reason to believe that at least 50% of the increase should still be attributed to the beneficial effects of applying an NPK mixture during the immature phase. It must be emphasized that a response of this nature can only be obtained from material that has been properly manured during the immature phase and not from material that has not been manured.

Field Experiment No. 2 — Effect of Four Levels of K in Presence N & P

Applications of higher levels of potassium up to four times the amount contained in the standard R. 4 : 6 : 2+Mg mixture failed to give any significant response in growth during the immature phase. Fertilizer application according to the treatments was stopped when the experimental area was brought into tapping in 1965.

Girth measurements recorded in 1966 did not reflect any significant differences in growth.

Though arrangements had been made to carry out yield assessments by test-tapping during the latter part of 1966, no test-tappings were done up to the end of 1966.

Field Experiment No. 3 — 2^3 NPK Trial :

The girth measurements recorded in 1966 reflect the same trends as reported previously, which are as follows :—

Of the three nutrients N, P and K applied at rates equivalent to twice the amounts contained in the R. 4 : 6 : 3 mixture, only nitrogen has so far shown at least a beneficial trend in girth.

In view of the fact that the estate management decided to bring this area into tapping only towards the end of 1966, it was not possible to carry out any test-tappings, as it was necessary to wait at least a couple of months after an area is brought into tapping for test-tappings to be carried out.

Field Experiments 4, 5, 12 & 13— 3×3×3 Nutrients cum Cultivation Treatments Trials:

Field Trials 4 & 5 were brought into tapping in 1966. Girth measurements recorded in 1966 failed to show any significant treatment effects. Yield assessments have been made only on three test-tappings so far.

Girth measurements recorded in Field Trials 12 & 13 have given the indications that mulching with Guatemala loppings can have a favourable effect on growth of *Hevea* plants when the loppings are brought from outside. It would appear that the cultivation of Guatemala grass between rubber rows planted 20 ft apart or less could possibly nullify the favourable influence of mulching with loppings of the grass.

This should perhaps be attributed to competition for soil moisture during periods of drought, as application of the major plant nutrients at higher levels did not have a compensating effect.

Field Experiments 6-10 — Response to Applications of Fertilizer Requirements as Determined by the Technique of Physiological Diagnosis :

The five long-term field trials in this series were in progress.

A brief account of the position in respect of these five trials as at end of 1966 and the trends observed on some of them are as follows :—

Field Experiment No. 6 — 1966 Replanting — PB 86 — Nakiadeniya Group — Galle District :

The experiment was commenced in 1960 *i.e.* after the area had received fertilizer applications according to normal estate policy for a period of four years.

Girth measurements have been recorded at the time of commencement of tapping and at yearly intervals thereafter.

In 1963, the trees that had girthed sufficiently to qualify to be brought into production were brought into tapping. As the percentage of trees that came into tapping was low, records of yield according to treatments were not maintained in the first year of tapping.

The yield records maintained by the estate during the second and third years of tapping being found unsatisfactory, as was the case with the yield records obtained from the other experimental areas in this series, yield assessment by test-tapping was commenced in 1966.

As was the case in previous years, the girth measurements recorded in 1966, were not found to be significantly different.

Field Experiment No. 7 — 1961 Replanting — PB 86 Immature Phase — Kalutara District :

Fertilizer applications according to treatments were given from the latter part of 1961 onwards. Height measurements at the end of the first year and girth measurements from the end of second year have been recorded at intervals.

The girth measurements as recorded in 1965 showed a trend in favour of the treatment receiving fertilizers as determined according to physiological diagnosis. This trend was found to have improved further according to the girth measurements recorded in 1966. The improved girth was just over half an inch per tree and this had been obtained with lesser expenditure on fertilizers.

Field Experiments 8, 9 & 10 (Experiments commenced in 1960) :

No. 8—1951 Replanting, Glen 1 — Kegalle District
No. 9—1949 Replanting, PB 86 — Kalutara District
No. 10—1949 Replanting, PB 86 — Kelani Valley District

Yield records maintained by the estates on commercial tappings being found altogether satisfactory, yield assessment by test-tapping in all three trial was commenced in 1966.

Since it has not been possible to record yields on this basis for a period of at least one full year, the yield results are not reported at this stage.

The yield records maintained by the estates in 1966, have not shown any significant differences due to treatments.

Judging by the results obtained in Field Trial No. 1 where a period of seven years had to lapse before the response to application of a complete NPK mixture against no fertilizer application could reach statistical significance, and that on rubber that had been manured only during the immature phase, the absence of response to differential manuring in these experimental areas which can be presumed to have been regularly manured for periods ranging from 2-5 years even after the areas came into production, there is no alternative but to continue these experiments over a longer period of time before arriving at any useful conclusions.

Field Experiment No. 11 — Experiment on Two Sources of Mg in the Presence of NP & K :

The primary objective of this trial was the verification of an opinion that was first expressed in 1960, to the effect that application of crushed dolomite to supply the magnesium requirements of the rubber plant, depressed the growth of the plants. The opportunity was also availed of to lay down a long-term fundamental NPK trial in a mono-clonal area planted on flat terrain at one of the Institute's experimental stations under conditions where magnesium could reasonably be expected to be not a limiting factor.

The experiment was laid down on a split-plot randomized block design, the NPK treatments randomized between plots and magnesium applied as common epsom salts and as dolomite randomized within plots.

Girth measurements recorded at intervals, including the measurements recorded in September 1966, have thus far not shown significant differences in girthing due to either the whole plot treatments or to sub-plot treatments.

The mean girth per tree in inches for the main plot and sub-plot treatment as recorded in December 1965 and November 1966 were as follows :—

FIELD EXPERIMENT NO. 11

Mean girth per tree in inches in 1965 and 1966

Treatments		1965	1966
Main plots	O	10·0	14·4
	N	10·6	14·9
	P	10·5	14·8
	K	10·9	15·3
	NP	10·9	15·5
	PK	10·9	15·3
	NK	11·0	15·7
	NPK	10·9	15·7
Sub-plot Mg as common epsom salts		10·6	15·0
Mg as dolomite		10·8	15·3

Field Experiment No. 14 — Growth Response to N, P and Mg, Each From Three Different Fertilizer Materials — Gallewatta 1961 Replanting PB 86 :

$3 \times 3 \times 3$ *Factorial Design*

Nitrogen as nitrate—N—N_0	(Applied as $NaNO_3$ first and then as ammonium nitrate)
Nitrogen as ammonia—cal—N	— N_1 (Applied as sulphate of ammonia)
Nitrogen as urea	— N_2 (Applied as urea 46% N)
Phosphate as super phosphate	— P_0
Phosphate as rock phosphate	— P_1
Phosphate as am. phosphate	— P_2
Magnesium as common epsom salts	— Mgo
Magnesium as dolomite	— Mg_1
Magnesium as kieserite	— Mg_2

Mean girth per tree in inches recorded in May 1966 are reported below.

FIELD EXPERIMENT NO. 14

	Treatment	Total girth	Mean girth Diff.	Sig. diff.
	0 NO_3—N	93·5	10·4	1·019
N	1 NH_4—N	101·3	11·3	
	2 Urea	108·4	12·0	
	0 Super	104·8	11·6	
P	1 Saphos	102·8	11·4	
	2 Amo. phos.	95·6	10·6	
	0 Common epsom salt	100·8	11·2	
Mg	1 Dolomite	105·0	11·7	
	2 Kieserite	97·4	10·8	

It will be noted that application of nitrogen as urea has resulted in an increase in girth of 0·7 per tree over that of nitrogen applied as sulphate of ammonia. Likewise application of magnesium as dolomite has resulted in an increased girth of the order of half an inch per tree over that of magnesium applied as common epsom salts.

In spite of the fact that the girth increases recorded are not statistically significant, the fact that the trend has been a positive one all along reaching significance at the 10% level of probability, the possibility of using urea and dolomite as sources of nitrogen and magnesium respectively, the change over to these fertilizer materials as alternate sources of nitrogen and magnesium can reasonably be expected not to have a significant depressing effect on growth under most circumstances. This finding is of very special interest in the present context of things.

Experiment No. 15 — Trial on Granulated Compound Fertilizers :

According to girth measurements recorded in 1966 the treatments receiving the three brands of granulated compound fertilizers continued to show an additional girth of 1″ per tree.

Field Experiment No. 16 — Effects of Different Levels of NP & K on Clone Susceptible to Wind Damage :

The primary objective of the experiment was to study the effect of reduced levels of nitrogen and potassium *viz.* normal rate, half rate and nil and of reduced levels of phosphorus (*viz.* normal rate and half rate) on the incidence of wind damage losses on clone LCB 1320 — a clone susceptible to wind damage. The study of the effect of these treatments on girthing and subsequent girthing and yield was incidental to the main objective.

An area replanted in 1959 with clone LCB 1320 was selected and the census of the wind damage losses that had already occurred in the area was taken prior to the commencement of the trial.

The experiment was laid down as a $3\times3\times2$ ($N\times K\times P$) factorial, with three replicates. Individual plot size was in the region of 75 trees to allow for an effective plot size of at least 30 trees.

Fertilizer application according to treatment commenced in the latter half of 1962. The fertilizers were applied in 2 applications per year. All plots received a basic application of magnesium as common epsom salts at half the normal rate.

In 1964, the management of the estate expressed a desire to delay tapping even after the area qualified to come into tapping. Finally when the management decided to allow only 10 acres out of the 24 to be tapped at the normal time, the opportunity was taken to bring one of the replicates (Block No. 2) into tapping in 1965. The trees in the remaining two experimental blocks were brought into tapping in 1966.

Girth of trees at the time of commencement of tapping and at subsequent intervals have been maintained.

Yield assessment by test-tapping in all three blocks was commenced during the latter half of 1966, and one test-tapping only was carried out in 1966.

Girth measurements recorded in 1966 had to be taken at a height of 5 ft to avoid interference by tapping cuts while taking girth measurements during the mature phase.

Results of girth increments as recorded in September 1965 at a height of three feet in all three blocks have been statistically analysed. There was no significant difference in girth increments due to treatments.

The experimental area, along with other parts of the estate suffered severe wind damage losses due to a freak storm in May 1965. A special census of the losses that occurred during this storm was taken immediately after.

20% of the trees in the experimental area out of a total of 4,050 trees covered by the experiment suffered damage. A census of the damage was taken in three categories — *viz.* uprooted, trunk snap and branch breakage. The count of trees that suffered damage in all three forms according to treatments within the effective plots are reported below :—

FIELD EXPERIMENT NO. 16

	K				P		
	0	½ Normal	Normal	Total	½ Normal	Normal	Total
0	33	34	49	116	65	51	116
N ½ Normal	32	40	59	131	63	68	131
Normal	62	52	24	138	65	73	138
	127	126	132	385	193	192	385

Differences in wind damage losses that occurred during a freak storm in 1965 were not found to be statistically significant.

Field Experiment No. 17 — Time of Fertilizer Application Trial :

Yields recorded under the different treatments as maintained by the estate for the year 1966 did not show any significant differences due to treatments.

As in the case of Field Trials Nos. 8, 9 and 10, yield assessment by test-tapping was commenced during the latter part of the year in order to overrule any possibility of yield recordings maintained by the estate on commercial tappings, being regarded as unsatisfactory.

Field Experiment No. 18 — Effect of Eight Levels of Standard NPK+Mg Mixture (R. 4 : 6 : 3+Mg) on Four Clones viz. RRIC 7, RRIC 45, RRIC 52 and PB 86, 1963 Replanting, R.R.I.C. Sub-station, Kuruwita :

The girth measurements as recorded in 1966 — three years from time of planting were statistically analysed. The treatment as well as the clone differences were found to be highly significant. The clone × treatment interaction being insignificant, the mean girth per treatment and mean girth per clone are reported below :

FIELD EXPERIMENT NO. 18

Mean girth per tree in inches

Treatment	R. 4 : 6 : 3+Mg Fertilizer mixture								Sig. diff.
Levels	0	1	2	3	4	5	6	7	P 5%=0·4″
Mean girth	5·2	7·5	7·4	7·7	7·9	7·9	8·3	8·5	P 1%=0·7″

It will be noted that the fertilizer treatments at all levels were significantly better than the control. Between levels of fertilizer application, while the treatment that received fertilizer application at 4 and 5 times the normal rates were significantly better than the standard dosage at the 5% level of probability, the treatments that received fertilizer applications at 6 and 7 times the normal dosage were better than the standard dosage at the 0·1% level of probability. The increases in girth observed in these instances however were of the order of half and one inch per tree respectively.

In respect of the four clones under trial, the three more vigorous clones girthed significantly better than the control clone PB 86.

From the results obtained, there is no reason to believe that any one of the vigorous clones had benefitted by the higher levels of fertilizer applied.

Hence the fairly justifiable conclusion that can be drawn from the data so far obtained is that there is no justification for applying higher levels of fertilizers for the more vigorous clonal materials.

Field Experiment No. 19 — Trial on Leguminous Cover vs Natural Ground Cover — Ground Covers :

The simple experiment to compare the effects of a pure legume cover as against natural covers kept under control by spraying herbicides on the growth of rubber plants was started in 1963.

Spraying rounds were regularly done to keep the ground cover under control. Strip weeding along the planting rows in the block under natural covers (controlled by the judicious use of herbicides) has been discontinued, as in future it is proposed that the planting row ' itself ' be kept clean by spraying herbicides.

The few patches of weeds like Lantana, Illuk and even rubber seedlings which continued to persist, in spite of the application of Grammoxone, Dowpon and DSMA at different times, were eradicated by spot spraying with herbicide ' Tordon K.'

There has thus far been no apparent difference in the growth of the rubber plants in the blocks which have been managed differently in respect of ground covers.

Field Experiment No. 20 — Trials With Different Levels of N, P, K & Mg on an Unmanured Mature Area :

Girth and yields recorded for a period of 12 months following fertilizer applications up to the end of March 1966 failed to show any clear-cut trends. The fertilizer treatments were repeated in 1966.

Individual tree test-tappings were carried out in this trial once per month in 1966 and ten recordings have been made for the year, test-tapping on two months being not possible due to rain interference.

The processing of this data has been delayed due to the detection of a discrepancy in the coversion factors used for correcting differences in moisture contents according to size of biscuits.

Attempts were made to elucidate the discrepancy by carrying out some investigations on the test-tapping biscuits collected from the experimental area. This has now been resolved.

The data now awaits processing and analysis. General indications are that trees that have not received fertilizer application for a period of time do not respond by showing sudden increases in rate of girthing and/or yield.

Field Experiment No. 21—Effect of Five Levels of N, P, K and Mg on Clone RRIC 45:

This trial has been laid down on an area which has been planted according to the improved system of planting on the contour in April/May 1966. Two fertilizer applications according to treatments were given during the year.

It is proposed to take height measurements at the end of one year's growth in April/May 1967.

Determination of optimum treatments in the production of different types of planting materials

Tjir 1 clonal seeds obtained during the seedling season in 1966 have been germinated and planted out on beds of two different sizes in a section of the seedling nursery at Nivitigalakele.

Growth measurements of these seedlings in these beds will be taken at intervals to ascertain the degree of genetic variability of the material and the degree of variability that can be attributed to edge effects with a view to determine the optimum number of plants on which observations should be made in studying different treatment effects in seedling nurseries.

Investigations on Wind Damage

In addition to the results of the census of wind damage losses experienced during a freak storm in one of the experimental areas, specially laid down for the purpose, reported under Field Experiment No. 16, census of wind damage losses encountered in two other experimental areas were carried out.

This was done in order to ascertain whether clone RRIC 52 was more susceptible to wind damage during the immature phase in comparison to other clonal materials.

Surveys carried out in a clone trial area at Nivitigalakele, where clones RRIC 52, RRIC 45 and PB 86 were under trial, and a clone/fertilizer trial area at the R.R.I.C. Sub-station at Kuruwita, where in addition to the above clones, clone RRIC 7 was also under trial, would seem to indicate that clone RRIC 52 is more susceptible to wind damage in comparision to the other clones studied.

On an appeal made to commercial estates, through Agency Houses, returns on wind damage losses experienced on commercial estates have been received. An examination of these returns revealed that not all estates were in a position to furnish the returns in the manner required.

All the estates that furnished the information as requested have now been written to and requested to furnish monthly returns for a period of one full year in 1967.

The data received from commercial estates in 1966 will be processed and reported in the course of 1967.

Role of nutrition on incidence of diseases of the rubber tree

No investigations were undertaken under this heading due to the delay in the erection of the glass house required for these investigations.

USE OF HERBICIDES FOR WEED CONTROL IN RUBBER PLANTATIONS

(*a*) *Suppression of Specific Weeds*

Ferns—*Dicranopteris linearis* (Bracken) and *Nephrolepis spp.*

Two formulations of a new herbicide known as Tordon 22 K and Tordon 101, with active ingredients of 2·0 lb and 0·75 gal. respectively have been tested for the control of ferns.

The two formulations were tested at 3 rates of application on mature foliage of the undesirable fern—Bracken occasionally encountered in patches in rubber plantations, and species of *Nephrolepis* found on embarkments between terraces.

The three rates of application were 6·0, 3·0 and 1·5 lb per 30 gallon of water.

It was observed that both formulations of Tordon even at the lowest concentration tried *i.e.* at 1·5 lb in 30 gallons of water gave a complete kill of the ferns in 2-3 weeks time, and no re-growth was observed even at the end of 4 months after spraying.

The *Addiantum spp.* of ferns was observed to be resistant to Tordon even at the highest rate of application.

(*b*) *Selective Control of Weeds in Cover Crops*

Mixtures of Dalapon, 2, 4-D and Diuron in different proportions and the proprietary herbicide mixture " Veedkil+" were sprayed on areas carrying a mixed cover of *Pueraria, Mikania* and grasses.

Mixtures of the three herbicides were tested in the following proportions :

Dalapon in lb	2, 4-D in lb	Diuron in lb
5	1	0
6	1	0
6	1	1
6	1	2
6	2	0
7	1	0

in 40 gal. water.

" Veedkil + " — 2 & 4 lb in 40 gallons.

It was found that none of the above mixtures was suitable, as the cover of *Pueraria* suffered equal damage as the other weeds.

It was observed that *Desmodium* cover was more resistant to these herbicides.

(*c*) *Maintenance of Planting Rows in Clean Weeded Condition*

After a round of clean weeding along the planting rows, Diuron was found to be a more efficient residual herbicide than Simazine, in maintaining the area as free of weeds as possible. The residual herbicide was more effective, when Paraquat at a low concentration of $\frac{1}{4}$ lb per acre was mixed with the residual herbicide at the first round of spraying, particularly if there had been a time interval between clean weeding and herbicide spraying. Even this did not prevent weeds like *Mikania* creeping into the sprayed area. In view of this, it was realised that it may be necessary to mix a hormone weed-killer like 2, 4-D with the Diuron at periodic intervals.

(*d*) *Use of Herbicides for Weed Control Where the Inter-row Area is Utilised for Cultivation of Catch Crops During the Early Years*

There have been no opportunities to pursue investigations of this nature.

(*e*) *Long-term Field Experiment to Evaluate the Comparative Costs of Chemical Weed Control vs Manural Weeding*

Before embarking on an experiment of this nature, it appeared necessary to try out some of the newer and safer general purpose herbicides singly and in mixtures so that the most effective and cheapest herbicide or mixture of herbicides may be applied at the appropriate times in the programme of chemical weed control.

The herbicides that are being screened are Afalon, Dacthal, organic arsenites (*e.g* di-sodium methyl arsonate) Paraquat, Dowpon, Amizole and mixtures of these with selective hormone weedkillers and/or residual herbicides.

It has been observed that for an effective chemical weed control programme in mature areas, mixtures of a grass killer, a selective hormone killer for *Mikania* and residual herbicide is invariably necessary.

INDEX TO FIELD EXPERIMENTS

Field Experiment No. 1 — Trial of N & K in presence of P

Field Experiment No. 2 — Effect of four levels of K in presence of N & P

Field Experiment No. 3 — 2^3 NPK trial

Field Experiment Nos. 4, 5, 12 & 13 — $3\times3\times3$ Nutrient cum cultivation Treatment Trials

Field Experiments Nos. 6 to 10 — Response to application of fertilizer requirements as determined by the technique of physiological diagnosis

Field Experiment No. 11 — Experiment on two sources of Mg in the presence of NP & K

Field Experiment No. 14 — Growth response to N, P+Mg, each from 3 different fertilizer materials

Field Experiment No. 15 — Trial on granulated compound fertilizers

Field Experiment No. 16 — Effects of different levels of NPK on clones susceptible to wind damage.

Field Experiment No. 17 — Time of fertilizer application trial

Field Experiment No. 18 — Effect of eight levels of standard NPK+Mg mixture (R.4 : 6 : 3+Mg) on four clones

Field Experiment No. 19 — Trial on leguminous cover vs natural ground cover

Field Experiment No. 20 — Trials with different levels of NPK+Mg on an unmanured mature area

Field Experiment No. 21 — Effect of five levels of NPK+Mg on clone RRIC 45

REVIEW OF THE RUBBER CHEMISTRY DEPARTMENT

By

M. NADARAJAH

SUMMARY

The Rubber Research Institute in collaboration with Lever Brothers worked on the economics of collections and processing of rubber seed. About nine commercial estates participated in this experimental project. This experiment will be continued in 1967.

Assistance was given to the P.W.D. in the addition of latex to bitumen in road surfacings. Assistance was also given to Nakiadeniya Group, Nakiadeniya, to carry out dirt content and volatile matter content determinations.

Samples of scrap from Ceylon Trading Co., Colombo, are being regularly tested for conformity to Technical Specifications with a view to improving these grades.

Experiments were carried out to detect the substance which is responsible for the natural resistance of some clones to Bark Rot and Bark cracking. Preliminary experiments indicate that clones susceptible to Bark Rot may contain low concentrations of tannins and those resistant, higher concentrations.

Experiments were continued to determine the factors which affect the Plasticity Retention Index of natural rubber. It was established that the PRI is a clonal factor. It was found that sodium metabisulphite, sodium sulphite and sodium bisulphite increases the PRI. Oxalic acid was found to be the best latex coagulant as regards PRI. UV light was found to have no effect on PRI of lace crepe. In sunlight, violet light was found to be the most harmful to rubber and green light the least. Of all the antioxidants tested pyrogallol was found to be the most efficient against sun-ageing.

Preliminary experiments were carried out with a view to producing oil-extended sheet rubber on a commercial basis.

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.

DETAILED REVIEW

GENERAL

Staff :

The Department consists of the Head of the Rubber Chemistry Department, Mr. M. Nadarajah, the Assistant Rubber Chemists, Mr. S. W. Karunaratne and Mrs. J. Sivabalasunderam, the Senior Technical Assistant, Mr. D. S. Muthukuda, six Technical Assistants, Messrs. M. T. Veerabangsa, G. G. Ghanasegaram, O. M. R. Sirisena, A. S. Dekumpitiya, D. D. Medagama and W. D. Dharmasena and eleven Minor Staff officers.

Mr. M. Nadarajah, Head of the Rubber Chemistry Department was awarded the A.I.R.I. in August. Mr. S. W. Karunaratne, Assistant Rubber Chemist, was at the National College of Rubber Technology, Northern Polytechnic, Halloway, London N-7, on a Colombo Plan Scholarship following a course in polymer technology. He was successful in the A.N.C.R.T. examination. Since October 1966, he is following a course at the University of Aston, Birmingham on the chemistry and technology of polymers leading up to the M.Sc.

Advisory Service :

Estates were given advice on smoke house operation, drying tower operation, sole crepe manufacture, crepe, sheet and scrap manufacture, weighing of latex, precoagulation, factory experiments, etc.

Visits :

	R.R.I.C. estates	Commercial estates	Other visits	Total
Head R.C. Department	6	40	34	80
Senior Technical Assistant	2	81	3	86
Technical Assistants	59	23	85	167
	67	144	122	333

Meetings, Lectures, etc :

The Head of the Rubber Chemistry Department gave talks on "Crumbled rubber manufacture and technical specifications" at the—

(1) Kegalle District Planters' Association Meeting at Kegalle on 26.1.66.

(2) Sabaragamuwa Planters' Association Meeting at Ratnapura on 17.2.66.

(3) Kalutara District Planters' Association Meeting at Tebuwana on 2.3.66.

The Head of the Rubber Chemistry Department addressed —

(1) A joint meeting of the Royal Institute of Chemistry and the Chemical Society of Ceylon on "Some recent developments in the production and marketing of natural rubber" on 17.4.66.

(2) The Institution of the Rubber Industry (Ceylon Section) on "Recent progress in the field of natural rubber chemistry and technology" on 31.5.66.

The Head of the Rubber Chemistry Department gave two lectures on "raw rubber manufacture" to the new recruits of the Ceylon Tyre Corporation at the tyre factory premises at Kelaniya on 19.8.66.

The Rubber Chemistry Department gave assistance to Museaus College with exhibits for their exhibitions in July 1966 and had a stall in the Rural Development Exhibition, Matugama, which was held on 16.8.66 and 17.8.66. The Department also assisted the Smallholdings Department at the Agrarian Services Rally and exhibition at Kalutara Vidyalaya on 20.9.66 and 21.9.66.

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 Thermos flask, 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 Institution of Rubber Industry (Ceylon Section) by Messrs. M. Nadarajah (18 lectures) and O. M. R. Sirisena (20 lectures) to conduct classes leading up to the L.I.R.I. Two practical classes were held at the R.R.I.C. for the L.I.R.I. students.

Research Investigations

Tannins in Bark :

Bark Rot is one of the major diseases affecting the rubber tree. Field experiments have shown that some clones are resistant to Bark Rot and some are susceptible. Bark Cracking, accompanied by the exudation of latex, is another disease fairly common in *Hevea* clones. Peries and Brohier (1965) have shown that Bark cracking is caused by a virus infection. Since tannins, which are a group of plant polyphenols, have fungicidal properties and are also known to be virus inhibitors, attention was directed to the study of naturally present tannins in bark with a view to correlating it with resistance to these diseases.

Bark samples from clones PB 86, PR 107, Mil 3/2, RRIC 45, RRIC 52, Glen 1 and Wagga 6278 were extracted with hot water and cold water and the total tannin content was determined spectrophotometrically. The results from this unreplicated preliminary trial indicate that clones susceptible to Bark Rot have a low concentration of tannins and those resistant higher concentrations. Chromatographic analysis indicated the presence of tannins with the pyrogallol group. It is possible that when tannins are present in higher concentrations they can prevent the entry of a fungus or other pathogen by its toxic action. It is suggested that the presence of higher concentrations of tannins is one of the factors which may be responsible for the natural resistance of some clones to Bark Rot and Bark Cracking. Further replicated experiments are presently being conducted to confirm the above findings.

Mould in RSS :

The effect of the fungicide Tego 103 G as a mould inhibitor was compared with Paranitrophenol (PNP) and Santrobrite. It was found that Tego 103 G is inferior to PNP and is weaker than even Santobrite.

The Plasticity Retention Index of Natural Rubber :

Further work was done to determine the factors which affect the Plasticity Retention Index of natural rubber. A Wallace steam plastimeter was used for these investigations.

The PRI of total solids film, shell scrap and panel scrap of nine clones were determined and it was established that the PRI is a clonal factor. It was found that clones RRIM 513, RRIC 7 and Wagga 6278 have high PRI values even after sun-ageing. This is expected as the colour of the total solids film of these clones is black. It was also noted that the PRI of panel scrap of these four clones are high. The colour of the total solids film of PB 86 is white and the PRI obtained after sun-ageing was low. Even the PRI of panel scrap was low. None of the total solids PRI was less than 80 and most of the untreated cup lump values were between 60 and 80. The PRI of untreated panel scrap was generally lower than that of the cup lump but was in most cases above 40. The panel scrap from PB 86 had values below 40.

It was found that sodium metabisulphite, sodium bisulphite and sodium sulphite increase the PRI, may be by inhibiting the enzyme polyphenol oxidase, since naturally occurring phenols are antioxidants.

Experiments were conducted using phosphoric acid, oxalic acid and formic acid as coagulating agents at pH 3·4, 4·0 and 4·6. Oxalic acid was found to be the best coagulant.

The effect of UV light and sun light on PRI was investigated and we have found that UV light has no adverse effect on PRI of crepe lace. Sun light was passed for 12 hours through Kodak filters on the crepe made from latex of clone PB 86. Violet light was found to be most harmful to rubber and green light the least harmful.

Of all the antioxidants tested, we have found pyrogallol to be most efficient against sun-ageing.

About 120 scrap crepe samples from commercial estates were tested and it was found that most of the samples could be classed as Grade 3. About 51 samples of RSS from nine commercial estates were tested and nearly all the samples come in the first grade.

PRODUCTION

Oil-Extended Rubber :

Experiments were performed with a view to producing oil-extended sheet rubber on a commercial basis. The preliminary investigation into this comprised finding a satisfactory emulsion which would mix homogeneously with the latex to give a uniform distribution of oil in the finished sheet. When stearic acid alone was used as emulsifying agent (ammonium stearate formed in situ), the following disadvantages were noted :

(1) The latex oil emulsion was not stable resulting in relatively rapid phase separation.

(2) A large quantity of stearic acid (3·5 parts per 100 parts oil) was required for satisfactory emulsification.

(3) The oil emulsion did not mix homogeneously with the latex.

(4) The coagulation was unsatisfactory resulting in uneven distribution of oil in the finished sheet.

Duponol O.S. was also used as the emulsifying agent in the following proportion :

Oil	..	100 g
Duponol O.S.	..	4 g
Water	..	96 g

The above emulsion was fairly satisfactory ; however it suffered from the same disadvantages as stearic acid.

Practically all the above disadvantages were got over by using an emulsifying system containing both stearic acid and Duponol O.S.

The petroleum oil used in these experiments was Dutrex 63 and a 50% emulsion of the oil in water was made as follows :—

A	Oil	..	100 g
	Duponol O.S.	..	3 g
	Stearic acid	..	0·25 g
B	Ammonia solution	..	20 g (containing 0·1g ammonia)
	Water	..	76·7 g

A and B were mixed well and the mixture was passed through a homogeniser six times. The oil emulsion was added to the latex in the following proportion :

25 parts oil+75 parts dry rubber. The volume of latex was so adjusted as to produce a sheet not weighing more than $1\frac{1}{4}$ lb. This condition was necessary as a heavier sheet tend to sag during smoking.

At first, the mixture of latex and oil was coagulated with 2% formic acid. The coagulation was not uniform and the finished sheet showed non-uniform distribution of the oil. However, coagulation carried out with a 1% solution of formic acid showed a marked improvement.

Rubber Technology

Routine Technical Specification Testing :

Assistance was given to Nakiadeniya Group, Nakiadeniya, to carry out dirt content and volatile matter content determinations on their group.

Samples of scrap from Ceylon Trading Co., Colombo, are being regularly tested for conformity to technical specifications with a view to improving these grades.

Miscellaneous

Rubber in Roads :

Assistance was given to the P.W.D. in the addition of latex to bitumen in road surfacings. Over 300 gallons of field latex in which the magnesium was removed by phosphate treatment and the latex stabilised with 0·3% ammonia and 0·3% Santobrite were supplied to the P.W.D. Some of these latices were used in surfacing a mile of road between the 7th and 9th mile posts on the Matugama-Kalutara route. Sections of this stretch of road were laid with bitumen having rubber contents varying from 0·5% — 5%.

The latex was added to the bitumen in the following manner :

¼ bottle of antifoaming agent in kerosene (1 oz. antifoam in 1 gallon kerosene oil) was added to 20 gallons bitumen which was heated and maintained at a temperature of 350°C and the latex was added slowly with stirring. The hot rubber bitumen mix was spread on the road surface evenly. The road was then covered with metal chips (¼"—½") and rolled four times.

Small quantities of specially compounded field latex, in which combinations of curing agents and accelerators had been added were supplied to the P.W.D. Research Institute for small-scale trials.

Earthenware Latex Cups :

With the high-yielding clones now being planted in Ceylon, we can foresee that the capacity of the coconut shells which are at present used for collecting latex may be inadequate. An alternative would be glazed earthenware cups. About 100, eighteen-ounce latex cups were made at the State Pottery Industrial Institute, Dediyawela, Kalutara, and are being tried out in the field. The cost of these cups was 20 cents each but it is expected that the price could be brought down if large numbers of these cups have to be manufactured.

Rubber Seed Oil :

During April of this year, Messrs. Lever Brothers (Ceylon) Ltd. sought our co-operation to go into the feasibility study of obtaining vegetable oil from rubber seed. A further conference with Lever Brothers resulted in their agreeing to extend the scope of their investigations so as to take in a minimum of 100 tons of collected rubber seed. This helped us to set down the following experiment at minimum costs to the Institute.

(*a*) To find seedling characteristics of various clones,
(*b*) To enable conditions and cost of collection of seed to be determined on a plantation scale,
(*c*) Processing of rubber seed.

Seedling Characteristics of Various Clones

The experiment was to collect seeds from 20-acre blocks of the clones PB 86, Tjir 1, Wagga 6278, Glen 1 and RRIC 45 at weekly intervals from the following estates :

(1) Culloden Group, Neboda.
(2) Vogan Group, Matugama.
(3) Atale Group, Atale.
(4) Pallegama Group, Niyadurupola.
(5) Clunes Estates, Dehiowita.
(6) Palm Garden Group, Ratnapura.
(7) Peenkande Group, Uda Karawita.
(8) Nakiadeniya Group, Nakiadeniya.
(9) Usk Valley Estate, Latpandura.

The experiments at Vogan Group, Usk Valley Estate, Palm Garden Group and at Peenkande Group were abandoned due to poor seed-fall. This poor seed-fall may be due to strong winds and heavy rain during the flowering season.

On the returns received from the above estates, only Clunes Estate has collected seeds on an experimental scale as required by us and the results are as follows :—

Clone	Acreage	Age (Yrs.)	No. of days collected	Total weight lb	lb/acre
Tjir 1	$30\frac{3}{4}$	28	8	5879	191
PB 86	$14\frac{1}{4}$	18	5	3040	217
PB 86	23	12	5	3181	138
Mixed	$25\frac{3}{4}$	14	4	3007	120
Mixed	269	9–29	9	10866	40

The seed-fall can therefore be estimated to vary at the rate of 1 ton for 10 to 20 acres.

Conditions and Cost of Seed Collection

Though Ceylon has approximately 650,000 acres of rubber land under cultivation, only about 450,000 acres could be considered as having mature rubber trees capable of giving seed. Even within this area, the collection of seed on estates having cover crops would be difficult and collection from hilly ground would be unpopular. Further, districts where *Oidium* and *Phytophthora* are prevalent would be unsuitable. *Oidium* causes premature leaf-fall which results in a marked reduction in flowering and consequently in the number of seeds produced per tree. *Phytophthora palmivora* by attacking the pods, causes a large number of seeds to be spoilt. Areas where there is rain during the seeding season would also be not suitable for seed collection. Hence it may only be possible to collect seed on a commercial scale from about 300,000 acres in any year giving about 15 to 30 thousand tons of seed.

As Messrs. Lever Brothers (Ceylon) Ltd. had agreed to use about 100 tons of rubber seed for their experiments, seeds were collected on a commercial scale from :—

St. Fergus Estate, Polgahawela.
Udapolla Group, Polgahawela.
Culloden Group, Neboda.
Atale Group, Atale.
Clunes Estate, Dehiowita.
Ambanpitiya Estate, Ambanpitiya.
Pallegama Group, Niyadurupola.
Nakiadeniya Group, Nakiadeniya.

The estates have charged from 3 cents to 6 cents per pound of seed excluding cost of bagging and transport. The collection at the lower rate was possible by organising children on the estates and adults in their spare time to do the collection.

Experiments will be continued in the 1967 seeding season. The feasibility of drying the seeds on the estate, and decorticating and winnowing at a few central places before despatch to Lever Brothers (Ceylon) Ltd. will also be explored.

Processing of Rubber Seed

Information on the technical details of the processing of rubber seed was supplied to us by Lever Brothers (Ceylon) Ltd. on about 120 tons of rubber seed collected in 1966.

In our recent experimental collection it was found that drying and sterilization were impracticable at the collection points due to non-availability of steam and suitable equipment.

Literature on rubber seed milling reports that seed can be kept for over four months if moisture is reduced to below 5%. We therefore dried a part of the collection in the sun for four days. Average moisture content of the kernel after four days drying was 4·32%. The bulk of the seed however, was dried for only 2 days and this reduced the moisture in the seed to 8%.

Sun-dried rubber seeds were cracked open on rubber rollers by increasing the gap between the two rollers to slightly less than the size of a seed. The cracked seeds were winnowed to separate shell from the kernel. At first, winnowing was done manually at the rate of 2 cwt. per hour. This rate was later increased to 15 cwts. per hour by using a mechanical winnower (hired from Messrs. Walker Sons & Co. Ltd.). It was very difficult to separate the shells from the kernels completely, and in fact 11% (average) shell was left with the kernel. It will be necessary to improve on this by further experiments.

The average free fatty acid in the kernel was 2·5%.

Expelling was possible, but the yield was very low. The quality of the oil was good. Free fatty acid in the oil averaged 11·0%.

Extraction

This proved complicated. Flaking was difficult and a percentage of extracted coconut meal had to be added as an experiment to help through the process. Though the kernel fed to the plant was with only 2·5% free fatty acid, the extracted oil averaged 22·4% free fatty acid. The yield of oil, though better than by expelling, cannot be considered satisfactory as the oil content in the resultant meal was 11·6%. Further experiments are necessary to improve results.

Soap Manufacture

Lever Brothers (Ceylon) Ltd. have hydrogenated the rubber seed oil obtained and successfully manufactured it into soap. However, it must be mentioned that the commercial aspects have not yet passed the pilot stage and much will depend on the actual costs of collection and milling of the large tonnage of seed as well as the price that can be obtained for the cake.

REVIEW OF THE STATISTICAL SECTION

By

N. NADARAJAPILLAI

GENERAL

Staff :

Mr. V. B. Solomon, the Assistant Statistician, continued his post-graduate studies at the Iowa State University.

The Assistant Statistician, Mr. N. Nadarajapillai was on duty throughout the year. The Statistical Section continued to serve the research departments mainly in their designs, statistical analyses and interpretations of field experiments.

Visits :

	No. of visits
Rubber seed oil project	16
Collection of statistical information	5
Collection of general information	6
Experimental	3
Discussion with Biometrician, C.R.I.	1
C.A.A.S. annual sessions	2
Total	33

DESIGN

A simple randomized block design had been handed over to the Plant Pathology Department for the studies on the control of *Fomes*. It is expected to lay this experiment at Glenesk Estate.

Preliminaries regarding the layout of a suitable design for a fungicide experiment at Gallewatta Estate were discussed with the Head of the Plant Pathology Department.

ANALYSIS OF EXPERIMENTS

Three sets of data from two field experiments at Farnham and Gallewatta Estates were analysed for the Plant Pathology Department.

The data from the following experiments were analysed for the Soils Chemistry Department :

Hedigalla	— 5 × 5 Graeco-Latin Square (NPK)
Parambe	(*a*) 3^3 — NP Cultivation Trial
	(*b*) 3^3 — KMg Cultivation Trial
Pannilla Group	(*a*) 3^3NPK Trial
	(*b*) 2^4 NPK Mg Trial at levels 0 and 1 of the nutrients
	(*c*) 2^4 NPK Mg Trial at levels 1 and 2 of the nutrients
	(*d*) 4 × 4 NP Trial with basic application of KMg.
	(*e*) 4 × 4 KMg —do— NP
	(*f*) 4 × 4 PK —do— NMg.
	(*g*) 4 × 4 NK —do— PMg.
Kuruwita	(*a*) A randomized split plot design of eight treatments replicated four times with basic application of dolomite and Mg SO_4
	(*b*) 3^3 — NP Cultivation Trial
	(*c*) 3^3 — KMg Cultivation Trial
Mirishena	3^3 — NPK Trial
Gallewatta	3^3 — NPMg Trial
Dewalakande	A randomized block design of five treatments replicated three times
Kumarawatta	23 NPK Trial
Nivitigalakele	Nursery Manurial Trial

Laboratory Experiments

The statistical analyses on the "Study of potassium status of soils in the rubber-growing areas in Ceylon" by Mr. R. S. John were carried out in collaboration with Mr. V. Abeywardene, Biometrician of the Coconut Research Institute.

The data on the study of the prophylactic action of tannin in *Hevea brasiliensis* were analysed for the Rubber Chemistry Department.

Miscellaneous

Board of Survey 1965 : Inventories of Dartonfield, Hedigalla, Nivitigalakele, Kuruwita and Head Office were checked and a report on the same was submitted to the Director.

Tamil Translation : The Tamil translations of the Provident Fund rules and the Annual Report for 1964 were checked.

Meteorology : The meteorological stations at Dartonfield, Nakiadeniya, Atale, Parambe, Elpitiya, Doloswella, Kuruwita and Nivitigalakele were continued to be maintained.

RUBBER RESEARCH INSTITUTE OF CEYLON DARTONFIELD, AGALAWATTA
SUMMARY OF METEOROLOGICAL OBSERVATIONS—JANUARY TO DECEMBER, 1966

Longitude : 80° — 09′ E.
Latitude : 6° — 32′ N
Height above sea level : 215′

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Mean maximum temperature	89·8	91·7	91·0	90·9	88·5	87·4	86·7	86·8	82·8	87·0	88·0	89·1
Mean minimum temperature	69·6	71·0	72·1	72·3	74·0	73·0	73·3	73·6	72·6	71·9	71·4	70·3
Average of max. and minimum means	79·7	81·4	81·6	81·6	81·4	78·7	80·0	80·2	77·7	79·5	79·7	79·7
Highest maximum temperature	95·5	95·5	93·0	93·5	90·5	91·0	88·0	89·0	90·0	90·5	96·0	91·5
Lowest maximum temperature	82·5	87·5	88·5	86·5	82·0	82·5	79·0	83·0	83·5	85·0	82·0	86·0
Highest minimum temperature	74·0	74·0	75·0	75·0	77·0	76·0	75·0	75·5	75·0	75·0	73·5	73·0
Lowest minimum temperature	63·0	68·0	69·5	70·5	69·0	70·0	72·0	71·5	71·0	70·0	67·0	63·0
Mean earth temperature at 8″	—	—	—	—	—	—	—	58·8	58·2	57·0	57·4	57·9
Mean earth temperature at 4″	82·2	82·9	83·5	83·6	84·2	82·9	82·8	82·5	81·4	80·0	80·3	80·2
Mean earth temperature at 4′	82·9	84·2	81·9	85·3	84·9	85·2	84·9	84·9	84·7	84·3	83·7	84·0
Mean relative humidity in % at 8.30 a.m.	70·5	75·0	75·5	76·5	78·4	76·4	76·4	75·6	75·0	74·5	74·7	73·0
Monthly rainfall in inches	7·07	6·61	10·62	21·16	4·82	10·31	8·90	15·41	26·53	25·94	12·23	7·84
Cumulative rainfall in inches	—	13·68	24·30	45·46	50·28	60·59	69·49	84·90	111·43	137·37	149·60	157·44
Most rainfall in one day in inches	1·78	3·40	2·50	2·90	1·05	2·28	2·08	3·23	7·25	5·00	2·10	1·56
Number of rainy days	14	9	14	25	18	21	21	23	22	23	10	14
Total hours of sunshine (bright light)	209·7	189·3	175·2	115·9	180·2	101·7	121·6	97·7	127·6	110·3	165·5	131·3
Daily mean hours of sunshine	7·2	7·3	6·3	4·1	7·2	3·8	4·3	3·8	4·7	4·1	5·7	5·2
Mean atmospheric pressure in millibars (8.30 a.m.)	1011·19	1010·45	1009·24	1009·24	1009·67	1008·84	1009·81	1009·00	1009·65	1009·64	1009·49	1009·35

REVIEW OF THE ESTATES ADVISORY DEPARTMENT

By

A. B. DISSANAYAKE

INTRODUCTION

Consequent on a Rubber Research Board decision, a new department for extension work designated The Estates Advisory Department was created and came into operation with effect from January 1966. The Chief Advisory Officer Smallholdings was transferred to take charge of this new department and one of the Senior Assistant Advisory Officers of the Smallholdings Department was also transferred to this Department as Estates Advisory Officer to assist him.

GENERAL

Staff :

The Head of the Estates Advisory Department and the Estates Advisory Officer assumed duties on 2nd January 1966 and continued to be on duty throughout the year.

A conference of Heads of Departments, arranged by the Director, discussed among other things, the training and gradual take-over of the routine advisory work which had previously been attended to by the research departments.

ADVISORY WORK

Categories of Estates :

The total area under rubber is 669,179 acres. This can be classified according to the size of the plantations as follows :—

TABLE I

RUBBER ACREAGE CLASSIFIED ACCORDING TO SIZE

Category	Size	Number of holdings	Extent in acres	% of total acreage
1. Smallholdings	0— < 10	144,149	201,814	30·1
2. Small estates	10— < 100	5,957	153,306	23·0
3. Medium estates	100— < 500	665	148,314	22·1
4. Large estates	> 500	181	165,745	24·8
Total		150,952	669,179	100·0

The Need for an Estates Advisory Department :

Of the 4 categories, the smallholdings which comprise 30·1% of the total acreage, are looked after by the team of officers attached to the Smallholdings Department. The large estates comprising 24·8% of the total acreage, seek advice generally on specific problems and having had more contact in the past with the Rubber Research Institute are not hesitant in asking for advisory visits. 45% of the total acreage under rubber falling within the other two categories (i) the small estates (23·0%) and (ii) the medium sized estates (22·1%), generally have, up to now not received much advice from the Rubber Research Institute. These groups, it is felt, are in particular need of general advice and it is the aim of the Estates Advisory Department to visit these estates and advise on all aspects of rubber cultivation and production as much as is possible with the available staff. Since the total acreage under these 2 categories (301,620 acres) is very large, a great effort will be needed if the newer findings of research are to reach these estates.

The officers manning this Department, on assuming duties had in the first instance a series of discussions with the Heads of the research departments and their assistants so as to familiarise themselves with the type of advice rendered by the research departments.

Advisory Visits With Scientific Officers :

Apart from discussions, the officers of the Advisory Department accompanied officers of the scientific departments on their advisory visits. The following is a break-up of the total number of such visits made by the Department for the year :—

TABLE II

VISITS TO ESTATES WITH SCIENTIFIC OFFICERS

Accompanying scientific officers	No. of visits
Rubber Chemistry	46
Botany	10
Plant Pathology	10
Soils Chemistry	7
Total	73

Visits to Large Estates by the Advisory Department :

The officers of the Advisory Department made visits on request to large estates. A break-up of these visits according to subjects would be as follows :—

TABLE III

VISITS TO ESTATES CLASSIFIED ACCORDING TO SUBJECT OF VISIT

Subject	No. of visits
Rubber manufacture	11
Poor yields	5
Diseases	11
Planting	5
General advice	5
Total	37

Other Visits :

In addition to the above the following visits have been undertaken by the Advisory Department to small and medium estates, as well as to other establishments like the office of the Rubber Controller, office of the Commissioner of Commodity Purchase and District P.A. meetings :—

TABLE IV

Establishment	No. of visits
Small and medium estates	242
District P.A. meetings	7
Others	19
Total	268

The visits to small and medium size estates were routine advisory visits where the visiting officer looked into all aspects of planting, cultural practices, manuring, diseases, tapping, manufacture and smoking of sheets. The visit was followed by a comprehensive report to the owner of the estate with information copies, where appropriate, to the conductor-in-charge. Whenever necessary, advisory circulars were also sent as additional instructional material.

Personal contact, though costly, is the most effective method, and this has been adopted as often as possible except in cases where very straightforward and simple requests were dealt with by letter.

OBSERVATIONS

During our routine visits, it has been observed, that most of the small estates close to towns are being blocked out and sold as building sites for houses.

Old rubber estates at fairly high elevations are being gradually converted to tea, as a subsidy is being given for this purpose.

During our visits, particularly to the medium and small size estates which manufacture smoked sheet, an effort has been made to help improve the quality of the end-product. I am happy to state that many of these estates have responded favourably. Follow up visits will be made, as soon as additional staff is recruited.

PUBLICITY

It is possible that some members of the planting community are not aware of the services provided by the Estates Advisory Department. We expect to publicise this in our Bulletin shortly so that owners particularly of small and medium size estates will feel free to refer to us any problems they may come across.

Already there is an encouraging response, judging particularly from the many unsolicited letters of appreciation which we have received.

APPRECIATION

The co-operation extended to this Department by owners of estates and their Superintendents and Conductors is greatly appreciated.

REVIEW OF THE SMALLHOLDINGS DEPARTMENT

By

H. H. PEIRIS

SUMMARY

The advisory service of this Department increased this year due to the introduction of a "crash programme". The issues of replanting and new planting permits continued while the organisation of sulphur dusting groups were undertaken during the period. Assistance to smallholders was given by way of advisory visits and free lining. The Publicity Unit functioned throughout the year.

The field staff devoted a part of their time in assisting new rubber planting smallholders. Every smallholding for which an application was made for new planting was visited by a Rubber Instructor before issuing a permit by the Rubber Controller and 1212 reports on the suitability of lands for new planting were submitted to the Rubber Controller. 588 new planting permits covering 829 acres 1 rood 39 perches were received from the Rubber Controller during the period as against 842 permits covering 1,191 acres 2 roods 26 perches in 1965. 1,747 visits were made by the field staff to these areas for advice and lining, and a new record sheet was entered up recording the condition in which the previous year's new planted areas were found and the work recommended. 1,350 final inspection reports out of 1,448 received were submitted to the Rubber Controller. Rubber Instructors have lined 140 acreas of 214 acres 1 rood 09 perches for soil conservation measures and 179 areas of 296 acres 1 rood 07 perches for planting points in 1965 and 1966 permit areas while 89 areas of 123 acres 2 roods 30 perches for soil conservation measures and 74 areas of 121 acres 2 roods 10 perches for planting points have been lined by Instructors in 1964/65 areas. Divisional Advisory Officers have checked lining of 59 areas. Rs. 5,324/37 have been paid as soil conservation grants for 136 areas, and 57 areas have been measured for recommending grants. 37,298 permit areas covering 52,685 acres 1 rood 16 perches were in force between 1952 and 1965 other than the areas mentioned above, and of these, 6,139 areas have been visited by field staff for advice and 6,032 trees have been marked for tapping.

Considerable attention has been paid by the field staff in assisting smallholders in replanting their holdings according to the requirements of the Rubber Replanting Subsidy Scheme. 3,448 replanting permits covering 4,663 acres 2 roods 11 perches have been issued and were in force as at 31.12.66, and every one of these areas was visited by an Instructor. Instructors have made 5,463 visits to 1966 areas and 24,242 visits to previous permit-areas. They have lined 1,184 areas of 1,509 acres 2 roods 14 perches for soil conservation works and 1,567 areas of 2,099 acres 2 roods 39 perches for planting points in 1965 areas and 395 areas of 682 acres 2 roods 33 perches for soil conservation works and 454 areas of 773 acres 3 roods 31 perches for planting points in previous permit-areas. 169 special reports on subsidy areas have been forwarded to the Rubber Controller. Instructors have marked for tapping 16,641 trees in 346 subsidy areas as demonstration and 91 visits were made at random to Commodity Purchase Depots for checking planting material issued to subsidy replanters.

Visits to mature areas are being made only on request or on special reasons.

98 out of the 103 sulphur dusting groups formed for dusting during 1966 season have been dusted and the balance 5 groups could not be dusted as the contractors failed to supply sulphur dust to these 5 groups in time. Each holding was dusted with 50 lb of dust per acre in 4 weekly rounds. The holdings that defoliated early, whether dusted or undusted showed no signs of *Oidium* infection due to dry climatic conditions that prevailed during the period. A total of 10,147¼ acres in 2,934 holdings have been successfully dusted. Arrangements have been made to dust 10,300 acres in the forthcoming season.

127 publicity meetings and exhibitions were held in ranges by Instructors assisted by Rubber Instructor, Publicity Unit. The Publicity Unit projected cine films on rubber manufacture, soil conservation and other agricultural interests. The film shows and exhibitions were well attended by smallholders. It also participated in 3 exhibitions and held 2 shows at R.R.I.C. headquarters and Torbay Stores. Another officer was appointed to the Publicity Unit in December with a view to expanding the propaganda work.

A "crash programme" to improve the percentage of Grade 1 RSS sponsored by the Department of Commodity Purchase at the request of the Minister of Commerce and Trade was undertaken during the period. Under this scheme smallholders were benefitted in the form of aluminium pans and strainers at very low subsidised rates and a grant ranging from Rs. 125/- to Rs. 200/- for each smokehouse built. There was a very high demand for aluminium pans and 20,000 pans and 4,367 strainers were sold. Grants have been paid to 157 smokehouses built during the period.

The officers of this Department rendered every assistance to smallholders in planting, maintaining their holdings and manufacture of sheet rubber. 4½ tons of rubber manure were purchased for 2 smallholders at a discount rate, and arrangements have been made for 6 smallholders to purchase rubber rollers through this Department at a discount.

The scheme of training smallholders in tapping, sheet manufacture and allied subjects was continued this year too. 1,264 applications were accepted in 49 classes and 797 trainees participated and 534 trainees were successful and certificates awarded.

The rainfall survey is being continued.

At the beginning of the year many administrative changes took place. The Chief Advisory Officer, Mr. A. B. Dissanayake was transferred to Estates Advisory Department as its Head while Mr. K. Wilson de Silva, Assistant Advisory Officer (North) too was promoted and transferred to the same Department as Estates Advisory Officer. Mr. H. H. Peiris, the Senior Assistant Advisory Officer at Smallholdings Department headquarters was promoted as Acting Chief Advisory Officer and Mr. D. E. A. Abeywickrema, the Assistant Advisory Officer (South) was promoted as Acting Deputy Chief Advisory Officer and transferred to Smallholdings Department headquarters. The posts of Assistant Advisory Officers were suppressed. Mr. C. Jayasinghe, the Senior Clerk was promoted as Chief Clerk. One new temporary Rubber Instructor was appointed, and the two Replanting Attendants were promoted to the posts of temporary Rubber Instructor. Mr. U. S. Wijepala, Rubber Instructor, was transferred to the Publicity Unit as R.I.,P.U. (2). The sudden death of Mr. K. A. M. Perera, an Instructor who counted over 18 years of service is recorded with deep regret.

The Acting Chief Advisory Officer and his deputy were on duty throughout the period.

Leaflet No. 10 on "Manufacture of smoked sheet" was published in Sinhala, while an abridged edition of this was published in English and Sinhala as Leaflet No. 11. The Annual Review of the Department was published in Sinhala.

This Department participated in 5 exhibitions and exhibits were lent to 3 more exhibitions.

4,022 special inspections were undertaken at the request of the Rubber Controller. 564 visits were made to Commodity Purchase Depots in connection with sheet improvement.

A series of lectures on rubber cultivation were given by the Divisional Advisory Officers to farm school students at various farm schools while 4 lectures were given to army personnel at Panagoda Army Agricultural Centre.

4,207 demonstrations on various aspects of rubber were given by Instructors, and 15,292 visits were made to demonstration and ordinary smokehouses for advice on construction. 86 visits too were made to rubber co-operative societies.

Rs. 22,280/- were given to 5 officers for the purchase of vehicles.

2 conferences of supervisory staff were held. The Acting C.A.O.S. attended 2 meetings of the Heads of Departments at Head Office, and a meeting of the Co-operative Department. The Acting Deputy C.A.O.S. too attended a meeting of the Co-operative Department. 3 Divisional Advisory Officers attended 3 meetings of various organisations. Rubber Instructor, Polgahawela attended a training course in community development. 2 meetings of the Selection Committee were held at the Smallholdings Department headquarters.

2 visitors of R.R.I. Malaya inspected smallholdings in Matugama, Ratnapura and Avissawella Divisions.

INTRODUCTION

The advisory services of the Smallholdings Department increased substantially during the year. One major factor for this increase was the introduction of a "crash programme" for the improvement of smallholders' smoked rubber sheet.

The issue of replanting and new planting permits continued during the period. Organisation of sulphur dusting groups and supervision of all such groups were undertaken. The Publicity Unit functioned in the field throughout the year. Assistance to smallholders was given in the form of advisory visits, lining for planting holes and soil conservation works and the usual free advice.

GENERAL

Staff:

At the beginning of the year many changes took place in the administration of the Department.

Mr. A. B. Dissanayake, Chief Advisory Officer Smallholdings was transferred as the Head of Estates Advisory Department with effect from 1.1.66.

Mr. H. H. Peiris, Senior Assistant Advisory Officer, was promoted to the post of Acting Chief Advisory Officer Smallholdings with effect from 1.1.66.

Mr. K. Wilson de Silva, Assistant Advisory Officer (North) was transferred on promotion to the post of Acting Estates Advisory Officer from 1.1.66.

Mr. D. E. A. Abeywickrema, Assistant Advisory Officer (South) was appointed Acting Deputy Chief Advisory Officer Smallholdings with effect from 1.1.66.

The posts of Assistant Advisory Officers were suppressed.

Mr. C. Jayasinghe, Senior Clerk of the Smallholdings Department headquarters was promoted Chief Clerk with effect from 1.2.66.

Mr. W. D. D. Rupasinghe, Nursery Clerk was appointed Rubber Instructor with effect from 1.6.66 and Messrs. P. I. N. Fernando and O. M. W. Tillekeratne, Replanting Attendants were promoted as temporary Rubber Instructors with effect from 15.5.66.

Mr. U. S. Wijepala, Rubber Instructor, was transferred to the Publicity Section as Rubber Instructor Publicity Unit (2) with effect from 1.12.66.

The Acting Chief Advisory Officer Smallholdings and the Acting Deputy Chief Advisory Officer Smallholdings were on duty throughout the period.

The sudden death of Mr. K. A. M. Perera, Rubber Instructor, on 20.3.66 is recorded with deep regret. This officer counted over 18 years of service in this Department.

Publications :

Leaflet No. 10 on "Manufacture of smoked rubber sheet" was published in Sinhala for distribution among smallholders.

An abridged edition of above was published as Leaflet No. 11 in English and Sinhala. About 7,500 copies of this leaflet were distributed among smallholders.

The Annual Review of the Department was published in Sinhala.

Exhibitions :

During the course of the year no new exhibits were made.

The Department participated in 5 exhibitions by having stalls and exhibits were lent to 3 exhibitions.

The exhibitions in which the Department participated were :—

Mahanama Vidyalaya Exhibition, Panadura — 24th to 27th June.
Kalutara Maha Vidyalaya Exhibition, Kalutara — 28th to 30th July.
Mahagama Rural Development Seminar and Exhibition, Mahagama—16th to 17th August.
Agrarian Services Rally and Exhibition, Kalutara—20th to 21st September.
Ananda College Exhibition, Colombo — 26th to 1st November.

Departmental exhibits were lent to the following exhibitions :—

Methodist College Exhibition, Colombo — 6th to 10th June.
Museaus College Exhibition, Colombo — 29th to 31st July.
Marie Montessori Primary School Exhibition, Dehiwela — 1st to 4th December.

Correspondence :

With the Rubber Controller :

Inward (with new planting applications) ..	.. 2,889
Outward (1045 preliminary reports 833 final inspection reports 1633 special reports)	.. 3,531

Others :—

Inward	.. 8,652
Outward	.. 11,835
From Rubber Instructors to permit-holders re lining	.. 2,912

Special Inspections for the Rubber Control Department :

Visits for preliminary reports	.. 1,212
Visits for final inspection reports	.. 1,350
Visits for special reports (new planting)	.. 1,200
Visits for special reports (subsidy areas)	.. 169
Visits for random checking of planting material to Commodity Purchase Depots	.. 91
Visits for sheet improvement to Commodity Purchase Depots	.. 564

Lectures, Demonstrations and Visits to Smokehouses :

A series of lectures on rubber cultivation were given to the farm school students at Ambepussa, Wagolla and Karapincha by Divisional Advisory Officers, Colombo, Kegalla and Ratnapura respectively.

4 lectures were given at Panagoda Army Agricultural Centre by D.A.O.S. Colombo for the benefit of the army personnel.

The following demonstrations were given by the Rubber Instructors :—

Sheet making ..	.. 2,071
Tapping ..	.. 727
Disease control ..	.. 386
Others ..	.. 1,023

Visits for advice on construction of smokehouses and improvement of sheets :—

Demonstration smokehouses ..	2,313
Ordinary ..	.. 12,979
Co-operative societies ..	86

Loans :

The following loans were given to field officers for the purchase of vehicles :—

Mr. B. D. Pedrick,	Divisional Advisory Officer ..	Rs. 10,000/-
,, W. D. D. Rupasinghe,	Rubber Instructor ..	,, 1,620/-
,, P. W. David,	—do— ..	,, 2,800/-
,, G. Weeratunga,	—do— ..	,, 4,500/-
,, K. A. Siripala,	Mechanic ..	,, 3,360/-

Conferences and Meetings :

Two conferences of the supervisory staff were held at S.H.Hq. on 23.2.66 and 7.9.66 mainly to discuss the " crash programme ". The Director was present at both conferences.

The Acting Chief Advisory Officer Smallholdings attended two meetings of Heads of Departments at Head Office, Agalawatta on 7th and 29th June, 1966. The Acting Deputy Chief Advisory Officer Smallholdings attended a Co-operative Department meeting on 7.6.66. The Acting Chief Advisory Officer Smallholdings was invited to attend a meeting of the Co-operative Department on 8.6.66 and he attended same.

The Divisional Advisory Officer Smallholdings, Kegalla, attended Paranakuru Korale divisional agricultural meeting on 15.11.66 at the request of Divisional Revenue Officer, Kegalle.

Rubber Instructor, Mawanella attended the Group and X'ray Campaign Programme meeting at M.O.H's office, Mawanella on 12.1.66.

Rubber Instructor Dehiowita attended Panawala and Atulugama Korale Karaka Sabha meeting on 25.3.66.

Rubber Instructor, Polgahawela attended a training course at the Institute of Training and Research in Community Development at Peradeniya from 7th to 20th October, 1966.

A meeting of the Selection Committee was held at the Smallholdings Department on 9.5.66 and 26.10.66 to interview candidates for 3 posts of temporary Rubber Instructors and for the appointment of Rubber Instructor, Publicity Unit (2) respectively.

Visitors :

Dr. and Mrs. A. Fong Chu Chai of Rubber Research Institute of Malaya visited Matugama, Ratnapura, and Avissawella Divisions for the purpose of seeing the conditions of the smallholdings and smallholders' smokehouses on 1st and 2nd March, 1966.

New Planting

The field staff devoted a part of their time in visiting, advising and assisting rubber new planting smallholders.

Every smallholding for which an application was made to exercise new planting rights was visited and reported on by a Rubber Instructor before the permit was issued by the Rubber Controller.

1239 new planting applications were received from the Rubber Controller for report and 1,212 reports on the suitability of land for planting rubber were forwarded to the Rubber Controller during the period.

The number of new planting permits received from the Rubber Controller during the period was 588 covering 829 acres 1 rood 39 perches and the number received during 1965 was 842 covering 1,191 acres 2 roods 26 perches.

1747 visits were made by the field staff to these areas (1965 and 1966 permit areas) 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 relevent form for each such permit area visited in 1966.

1,448 final inspection reports were received from the Rubber Controller and 1,350 were reported back.

The details of lining done by Rubber Instructors are as follows :—

			A. R. P.
1965/66 areas	— Lined for soil conservation works	140 areas	— 214. 1. 09
,, ,,	— Lined for holes	—179 ,,	— 296. 1. 07
1964/65 ,,	— Lined for soil conservation works	— 89 ,,	— 123. 2. 30
,, ,,	— Lined for holes	— 74 ,,	— 121. 2. 10

The Divisional Advisory Officers have checked lining in 59 areas.

A sum of Rs. 5,324·37 was paid as soil conservation grants as per details below:—

1st instalment to	54 permit areas	— Rs.	3,345·66
2nd ,, ,,	82 ,, ,,	— ,,	1,978·71
	136		5,324·37

During the period 57 permit-areas have been measured for recommending soil conservation grants.

Other than the permit areas noted above the officers were directly in charge of 37,298 permit areas covering 52,685 acres 1 rood 16 perches being the total number of permit areas issued between the years 1952 and 1965.

Of these the field officers have visited 6,139 permit-areas for general advice etc. 6,032 trees have been marked for tapping by Rubber Instructors in 83 permit areas.

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 in respect of smallholdings during the year were in force as at 31st December, 1966.

No. of permits	A. R. P.
3,448	4,663 2 11

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 3,448 smallholdings was visited by a Rubber Instructor.

The number of permits issued during the previous years in respect of smallholdings is 60,654 covering an extent of 87,835 acres 0 roods 38 perches.

The Rubber Instructors have made 5,463 visits to 1966 permit areas and 24,242 visits to previous permit areas.

The details of lining done by Rubber Instructors are as follows :—

			A. R. P.
1965 areas — lined for soil conservatoin works	— 1,184 areas	—	1,509.2.14
,, ,, — lined for holes	— 1,567 ,,	—	2,099.2.39
Previous permit areas — soil conservation works	— 395 ,,	—	682.2.33
,, ,, ,, — lined for holes	— 454 ,,	—	773.3.31

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

16,641 tappable trees in 346 subsidy replanted smallholdings have been marked by Rubber Instructors by way of demonstrations.

91 visits were made to the Commodity Purchase Depots by the field staff for the purpose of random checking of planting material issued to subsidy replanting smallholders.

Mature Holdings

(New planting and old rubber)

Visits to these areas are being made only on requests from permit holders or for special reasons such as sulphur dusting.

Sulphur Dusting

The State-aided Sulphur Dusting Scheme organised by the Department was carried out this year too.

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 sulphur dusting groups were given to the staff. The necessary forms for these purposes were distributed among the staff.

Collection of money for incidental expenses in the co-operative dusting scheme had to be done with difficulty as the payments were not regular. Rs. 5/- per acre was collected from the group members for this purpose.

The departmental mechanic and the agents of the dusting machines did the servicing and repairing of machines prior to the commencement of dusting. Each accepted co-operative dusting group was issued a dusting machine on loan. Spare machines were made available at central spots in order to avoid interruptions during dusting. The field staff had to face much difficulty in forming most of the groups,

Of the 103 groups formed for dusting during the 1966 season, 5 groups were not dusted as the contractors failed to supply the sulphur dust when the groups needed same. Hence dusting operations were carried out only in 96 groups.

The following figures show the details of acreage and the number of holdings proposed for dusting along with the figures for 1965.

TABLE I

ACREAGE OF DUSTED HOLDINGS 1966

District	Acreage 1965	Acreage 1966	Holdings 1965	Holdings 1966
Kalutara	2,834¾	2,876	814	880
Colombo	2,260	2,367¾	784	809
Kegalla	1,939¾	2,341	588	640
Ratnapura	1,590½	1,835¾	470	554
Galle	646¾	940½	153	195
Matara	500	331¾	69	58
Kandy	74	74	14	14
Total	9,845¾	10,766¾	2,892	3,150

The distribution of dusting groups according to districts is given below :—

TABLE II

DISTRIBUTION OF DUSTING GROUPS ACCORDING TO DISTRICTS 1966

District	Distribution of Groups 1965	Distribution of Groups 1966
Kalutara	26	26
Colombo	21	23
Kegalla	22	27
Ratnapura	14	15
Galle	6	8
Matara	5	3
Kandy	1	1
Total	95	103

Each group had its machine operator and two labourers to carry the machine. Most of the machine operators had previous experience in sulphur dusting and therefore only a few demonstrations were given to train the personnel.

The Rubber Instructors were instructed personally to supervise the first two rounds of dusting in all groups. Subsequent rounds of dusting were to be supervised as their other duties permitted. Each holding was supplied with 50 lb of dust per acre to be dusted in four weekly rounds and most of the members have dusted their holdings four times according to the weekly cycle.

Dusting operations for the season commenced on 22.1.66 in Warakapola Range and the last date of dusting was on 22.3.66 in Gampaha Range.

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

This year, the holdings that defoliated early, whether dusted or undusted, showed no signs of *Oidium* infection due to the dry climatic conditions that prevailed during the period.

The details of dusting operations are as follows :—

Number of groups dusted	98
Number of holdings dusted	2,934
Total acreage	10,147¼ acres
Average size of a holding	3·5 acres
Size of smallest holding	¼ acre
Size of largest holding	31 acres
Average number of holdings in a group	30
Average cost of dusting an acre including cost of sulphur	Rs. 11·31
Acreage subsidised	8,494¼ acres
Acreage non-subsidised	1,653 acres
Percentage of subsidised acreage	83%
Average acreage per dusting group	103·5 acres

The subsidised areas were provided with sulphur at the rate of Rs. 6·05 per acre and the non-subsidised areas at Rs. 12·10 per acre.

The 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 areas were free from *Oidium*.
2. In general the incidence of the disease in undusted holdings has been heavier.
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 seheme this year have expressed their willingness to participate in the scheme in the coming year as well.

For the 1967 dusting season arrangements were made to dust about 10,300 acres.

The Rubber Instructors have made 19,508 visits to sulphur dusting areas during the period.

VILLAGE PROPAGANDA

During the year a total of 127 publicity meetings and exhibitions were held in the ranges by Range Instructors assisted by the Rubber Instructor, Publicity Unit.

At some of these exhibitions local exhibits collected by the Rubber Instructors were displayed. The Publicity Unit projected cine-films relating to rubber manufacture, soil conservation and other agricultural interests borrowed from the Department of Agriculture and the British Embassy, in addition to the departmental film on rubber bought from the British Embassy. This latter film was projected with a simultaneous commentary in Sinhala by the Rubber Instructor, Publicity Unit. We expect to have our own documentary film in Sinhala on rubber by the end of the next year. The film shows and exhibitions were well attended by the smallholders.

The details of the publicity meetings held are as follows :—

Matugama Division	..	21
Colombo ,,	..	25
Avissawella ,,	..	23
Ratnapura ,,	..	22
Galle ,,	..	19
Kegalla ,,	..	12
		122

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

Mahanama Vidyalaya, Panadura	24th and 25th June, 1966
Kalutara Maha Vidyalaya Exhibition ..	28th and 29th July, 1966
Agrarian Services Rally and Exhibiton, Kalutara	20th September, 1966

Two special shows were held at the following places :—

Rubber Research Institute office, Agalawatta	on 3.7.66
Torbey Stores, Mattakkuliya	on 3.9.66

With a view to expanding the propaganda work another officer was appointed as Rubber Instructor, Publicity Unit as from 1st December, 1966. This officer was under training till the end of the year.

IMPROVEMENT OF SMALLHOLDERS' SHEET

A "crash programme" sponsored by the Department of Commodity Purchase at the request of the Hon'ble Minister of Commerce and Trade for improving the percentage of Grade 1 RSS of smallholders was started during the period. A sum of Rs. 100,000/- was released for this purpose and the smallholders received the following benefits :—

20,000 aluminium coagulating pans at a subsidised rate of Rs. 2·50 each,
5,000 wooden strainers fitted with monel mesh at a subsidised rate of Rs. 2·00 each.

Grants for 160 smokehouses as per details below :—

(*a*) Rs. 125/- for a smokehouse of 120 lb capacity
(*b*) Rs. 150/- for a smokehouse of 125 lb capacity
(*c*) Rs. 200/- for a smokehouse of 350 lb capacity

Cash prizes amounting to Rs. 4,585/- were awarded to winners of smallholders' rubber sheet competitions at range, division and island-wide levels.

Intensive propaganda was done through the press, cinema-slides, posters, departmental Publicity Unit and propaganda meetings.

There was a very high demand for aluminium coagulating pans and within a few months the full stock of 20,000 pans was sold. By the end of the year 4,307 monel mesh strainers had been sold out. 170 subsidised smokehouses were started during the year and 157 has been completed. Further, with the assistance of the officers of this Department, 165 ordinary smokehouses were started of which 86 were completed.

The range and divisional sheet competitions were held during the year. The officers of the Department of Commodity Purchase and superintendents of nearby estates acted as judges in most of the competitions. The writer's thanks are due to them for the valuable services rendered.

The all-island sheet competition was arranged to be held in early 1967.

General Assistance

The officers of this Department rendered assistance to smallholders in lining, planting, manuring, establishing cover crops, disease control, marking of trees for tapping, sheet making, constructing and improving of smokehouses during the period.

4½ tons of R. 4 : 6 : 3+ Mg rubber manure were bought by 2 smallholders through the Department at a discount rate. Arrangements were made for 6 smallholders to purchase 5 spiral and 2 plain rubber rollers through the Department at a discount rate from Messrs. Jinasena & Company.

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 training classes were received by the end of April, 1966, and 49 classes were started. Later, 8 classes had to be abandoned due to very poor attendance and 41 classes were successfully completed. 797 smallholders participated in the classes and 534 smallholders were successful and received certificates.

TABLE III

SMALLHOLDER TRAINEES SUCCESSFUL IN THE TRAINING SCHEME IN TAPPING CLASSIFIED ACCORDING TO DIVISIONS

Divisions	No. of trainees accepted	No. of trainees participated	No. successful
Kegalla	127	87	64
Avissawella	170	129	69
Colombo	123	71	48
Ratnapura	232	158	99
Matugama	296	165	126
Galle	316	187	137
Total	1,264	797	534

SURVEYS

The rainfall survey was being continued.

REVIEW OF THE ESTATE DEPARTMENT

By

L. WIJEYEGUNAWARDENE

Acreage Summary — Dartonfield Group :

Rubber	Dartonfield			Nivitigalakele			Hedigalla			Total		
	A.	R.	P.	A.	R.	P.	A.	R.	P.	A.	R.	P.
Mature	72	3	19	87	0	31	677	3	16	837	3	26
Immature	45	3	00	59	1	28	33	0	31	138	1	19
Nurseries	3	2	00	8	1	07	—	—	—	11	3	07
Total	122	0	19	154	3	26	711	0	07	988	0	12
Abandoned	8	3	00	0	2	00	—	—	—	9	1	00
Building sites etc.	40	2	36	15	1	33	8	1	18	64	2	07
Pinewood plantation	—	—	—	—	—	—	1	0	34	1	0	34
Roads	6	2	22	0	3	27	9	0	04	16	2	13
Swamp areas	—	—	—	0	2	08	0	2	20	1	0	28
Streams and reservations	0	0	29	—	—	—	13	0	29	13	1	18
Jungles etc.	—	—	—	1	3	38	395	0	00	396	3	38
	178	1	26	174	1	12	1,138	1	32	1,491	0	30

Visiting Agent : Mr. M. W. Thompson paid two visits to the Institute's properties one in April and the other in October, 1966. Reports on these visits were submitted to the Rubber Research Board.

Weather (Estate Gauge) : Comparative rainfall figures (inches) for 1966 are given :

Month	Dartonfield		Nivitigalakele		Hedigalla	
	1966	1965	1966	1965	1966	1965
January	7·52	2·30	6·92	3·48	9·75	5·25
February	6·61	7·06	5·03	8·24	4·48	7·73
March	11·44	13·02	11·01	10·83	14·22	10·47
April	21·41	16·21	22·97	13·25	23·54	17·05
May	4·82	27·37	8·44	23·30	5·97	31·31
June	10·31	9·40	9·59	7·17	10·57	11·18
July	8·90	7·91	8·21	8·11	8·45	4·40
August	14·80	25·40	11·19	19·92	14·50	17·63
September	25·90	26·13	22·31	20·07	29·78	19·29
October	25·94	22·47	18·91	21·92	19·62	17·39
November	13·23	16·76	15·10	14·31	8·81	16·03
December	7·84	12·31	7·58	8·84	11·89	19·41
	158·72	186·34	147·26	159·44	161·58	177·14

Average (5-year period) :		193·06″		171·11″		195·94″
Total No. of wet days	219	231	207	202	221	241

The rainfall for the year at Dartonfield, Nivitigalakele and Hedigalla Divisions amounted to 158·72,″ 147·26″ and 161·58″ on 219, 207 and 221 days respectively and was below the quinquennial average. The months of January, March and April were wetter than last year with heavy evening showers, whilst May was exceptionally dry. A similar distribution of rainfall as that of the previous season was experienced in June, July and August. The North East monsoon was more pronounced this year than last year.

Crop.—Weather conditions during the year were more conducive for harvesting of crop than in recent years. The unusually low rainfall and the favourable pattern of the distribution of same recorded at Hedigalla Division during the season, helped considerably to offset the recurrent losses of tapping days experienced on this Division. A very satisfactory crop of 104·03% of the season's estimate was harvested on the Group.

	1966		1965	
Estimated ..	692,000	lb	700,000	lb
Harvested ..	719,890	,,	579,117	,,
Increase ..	27,890	,, Decrease	120,883	,,

The crop harvested for the year 1966=104·03% of the season's estimate.

Comparative Yield Records of Individual Fields :

Dartonfield	Acreage in tapping	Total yield in lb		Yield in lb per acre	
		1966	1965	1966	1965
1950/51 replanted area	25¾	17,201	16,004	668·0	621·5
1952 ,, ,,	27	27,839	27,295	1,031·1	1,010·9
1953 ,, ,,	8	8,123	6,770	1,015·4	846·2
1954 ,, ,,	2½	2,773	1,674	1,109·2	669·6
1955 ,, ,,	5	3,422	2,427	684·4	485·4
1955/56 ,, ,,	4¾	4,039	2,836	850·3	597·0
	73	63,397	57,006	868·5	780·9

Nivitigalakele	Acreage in tapping	Total yield in lb		Yield in lb per acre	
		1966	1965	1966	1965
1935 replanted area	—	—	3,419	—	402·2
1939 ,, ,,	10¼	7,278	15,573	710·0	1,519·3
1940 ,, ,,	9¾	9,865	14,702	1,011·8	1,507·9
1940 swamp area	3¼	3,158	3,090	971·6	950·7
1941 clearing	7	12,229	10,389	1,747·0	1,484·1
1942 ,,	4½	4,354	6,460	967·5	1,435·5
1943 ,,	7	5,852	6,126	836·0	875·1
1944 ,,	4½	4,936	5,650	1,096·8	1,255·5
1946 ,,	21	28,587	30,225	1,361·3	1,439·3
1953 ,,	10	12,106	10,073	1,210·6	1,007·3
1954 ,,	10	12,789	9,853	1,278·9	985·3
	87¼	101,154	115,560	1,159·4	1,206·9
Hedigalla					
1943 clearing	10¼	9,273	8,560	904·7	835·1
1944 ,,	11¾	9,576	8,676	815·0	738·4
1945 ,,	22¼	15,591	14,566	700·7	654·6
1946 ,,	12¾	9,205	10,246	722·0	803·6
1947 ,,	45	26,487	23,920	588·6	531·5
1949 ,,	34¾	37,480	30,279	1,078·6	871·3
1950/51 ,,	18	20,422	13,090	1,134·6	727·2
1952 ,,	79½	69,479	60,319	874·0	758·7
1953 ,,	132½	124,107	86,536	936·7	660·6
1954 ,,	171	120,843	80,691	706·7	467·8
1955 ,,	78	70,843	49,519	908·2	634·8
1956 ,,	55	37,432	20,149	680·6	419·8
1957 ,,	7	4,601	—	657·3	—
	677¾	555,339	406,551	819·4	612·5
Total for the Group	838	719,890	579,117	859·1	695·6
Other sources		737	806		
Total		720,627	579,923		

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.

Analysis of Tapping Rounds on Dartonfield Group for 1966 (1965 figures in brackets) :

Dartonfield	Early tapping	Late tapping	No tapping		
			Winter rest	Rain	Holidays
1st quarter	71 (76)	14 (12)	– –	2 (1)	3 (1)
2nd ,,	55 (48)	19 (22)	– –	13 (17)	4 (4)
3rd ,,	47 (40)	21 (27)	– –	24 (25)	– (–)
4th ,,	51 (53)	33 (24)	– –	7 (14)	1 (1)
	224 (217)	87 (85)	– –	46 (57)	8 (6)
Nivitigalakele					
1st quarter	74 (79)	14 (9)	– –	2 (1)	– (1)
2nd ,,	43 (37)	32 (29)	– –	10 (19)	6 (6)
3rd ,,	42 (39)	26 (32)	– –	24 (21)	– –
4th ,,	48 (52)	31 (25)	– –	13 (15)	– –
	207 (207)	103 (95)	– –	49 (56)	6 (7)
Hedigalla					
1st quarter	70 (72)	16 (9)	– –	4 (9)	– –
2nd ,,	44 (35)	27 (19)	– –	16 (32)	4 (5)
3rd ,,	46 (34)	21 (18)	– –	25 (40)	– –
4th ,,	46 (46)	32 (25)	– –	14 (21)	– –
	206 (187)	96 (71)	– –	59 (102)	4 (5)

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

Latex grades	Total in lb	Percentage
Pale crepe No. 1 ..	496,905	69·03
,, ,, ,, 2 ..	9,454	1·31
,, ,, ,, 3 ..	109,634	15·23
Latex for experiments ..	4,424	0·61
	620,417	86·18
Scrap crepe No. 1 ..	71,792	9·98
,, ,, ,, 2 ..	18,592	2·58
,, ,, ,, 3 ..	9,089	1·26
	99,473	13·82
Total ..	719,890	100·00
From outside sources ..	737	
	720,627	

The production of a high percentage of uniform No. 1 crepe is made increasingly difficult with acreages of experimental areas of numerous clones with different latices in production.

Miscellaneous :

Field and Factory Experiments : The Rubber Chemistry, Botany, Plant Pathology and Soils Departments were given assistance in carrying out their field and factory experiments.

Estimates : Estimates of capital and revenue expenditure for 1967 in respect of Dartonfield Group, prepared and submitted by the writer to the Rubber Research Board, were approved.

Estate Roads : 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 : Climatic conditions this year were more favourable for the inhibition of the growth and spread of the fungus *Oidium heveae.*

Wintering was generally early at Dartonfield and Nivitigalakele but due to the multiplicity of clones at Hedigalla Division the wintering was rather protracted and late winterers suffered a mild attack. A very satisfactory control was however achieved and a good foliage canopy was obtained.

Gloeosporium alborubrum : The incidence of *Gloeosporium* was negligible.

Phytophthora palmivora : The leaf-fall due to *Phytophthora* was mild and was confined to the crown budded areas of LCB 870, AVROS 255 and a few non-recommended clones under test. Satisfactory control was achieved by spot dusting with Copper based fungicidal dust.

Bark Rot : The incidence of Bark Rot on the Group was negligible. Towards the end of the year the clone RRIC 36 however showed marked outbreaks of Bark Rot.

Wind Damage : This was rather marked this season with Dartonfield, Nivitigalakele and Hedigalla having 57, 153 and 1,053 trees respectively wind damaged.

Capital Account — Agricultural Development

Dartonfield Division — Immature Areas :

1960/61 replanted area	.. ..	31½	
1965 ,, ,,	.. ..	14¼	.. 45¾ acres

Nivitigalakele Division — Immature Areas :

1962	replanted area	.. ..	$16\frac{3}{4}$	
1963	,, ,,	.. ..	14	
1964	,, ,,	.. ..	10	
1965	,, ,,	.. ..	10	
1966	replanting	.. ..	$8\frac{1}{2}$ ..	$59\frac{1}{4}$ acres

Hedigalla Division — Immature Areas :

1965	replanted area	.. ..	$11\frac{1}{4}$ ..	$11\frac{1}{4}$ acres

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

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 is 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 of root diseases were carried out.

1963 Replanted Area (14 acres) at Nivitigalakele : This is planted with five plots of 3,000 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. Uneven growth. 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* : This is planted with 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 are in good fettle. Growth though uneven is good. Close attention was paid to weeding, manuring and root diseases.

(*b*) *10 acres at Nivitigalakele :* This area consists of a monoclonal block of RRIC 45. Growth is satisfactory. Routine agricultural operations were carried out.

(*c*) *11¼ 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 consisted of LCB 870 buddings. This carries plants of RRIC 52. Growth is satisfactory.

1966 Replanting :

8 acres at Nivitigalakele : This was replanted during the South West monsoon of 1966, in keeping with the requirements of the Plant Breeding and Botanical Departments. Details of material used are as follows : RRIC 45 — 265 plants ; clone No. 451 — 384 plants ; clone No. 1000 — 296 plants and another 102 plants made up of the following : J 1, *Hevea sp.*, RRIC 5, 7, 41, 45, 52, 58, 59 and 86. The plants are coming on well.

NURSERIES

Budwood Nurseries — Dartonfield :

(*a*) Routine weeding and clearing of drains were carried out in 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 :—

Plant Pathology Department experiments ..	134	budded stumps
Botany Department experiments	275	,, ,,
Total ..	409	,, ,,

Budwood Issues :

Outside estates	233	yards
Botany Department experiments	1,362½	,,
Plant Breeding Section experiments	35	,,
Nivitigalakele budgraftings	22½	,,
Hedigalla new budwood nursery	575	,,
Total ..	2,228	,,

LABOUR AND HEALTH

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

(*b*) *Line Rooms :* Line room accommodation was satisfactory.

(*c*) *Wages :* Wages were paid during the year in accordance with the Wages Boards Ordinance in force.

Dartonfield Group

Working Ceylonese	Resident	Non-resident	Total
Men ..	111	193	304
Women ..	99	164	263
Children ..	—	—	—
Working immigrants			
Men ..	37	—	37
Women ..	23	1	24
Children ..	—	—	—
	270	358	628

(*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 :* Twenty-nine full maternity benefits and four medical wants benefit payments were made.

(*f*) *Feeding Children and Milk Food :* Free rations and ¼ 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 :* Twenty-two children were born during the year on the Group.

(*j*) *Deaths :* There were four deaths on the Group this year.

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

Influenza	2,427
Ulcers	456
Ankylostomiasis	44
Diarrhoea and Enteritis ..	907
Eye and ear diseases ..	177
Other diseases	7,221
Total ..	11,232

RUBBER REPLANTING SUBSIDY SCHEME NURSERY AT HEDIGALLA

Supervision : The Estate Superintendent, R.R.I.C., paid supervisory visits to this nursery upto September, 1966.

Staff : Mr. L. H. Samaranayake, Assistant Nursery Manager.

Rainfall : 161·58" were recorded this year against 117·14" in 1965. There were 221 wet days in the year.

Seedling Nursery :

Maintenance : The seedling and budwood nurseries were satisfactorily maintained. Routine agricultural operations were carried out.

Pests and Diseases :

(*a*) The incidence of *Oidium* was light. Two rounds of sulphur dusting was carried out in February. No further dusting was necessary.

(*b*) There was no attack of *Phytophthora* or *Gloeosporium* during the year.

Planting Material : The issues of planting material from this nursery was as follows :—

	S.W. planting	N.E. planting	Total
Clonal seedlings	9,422	10,092	19,514
Budded stumps	28,985	14,558	43,543
	38,407	24,650	63,057

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

Visiting Agent : Mr. E. O. B. Lover.

Estimates : In July 1966 it was decided that the Rubber Replanting Subsidy Scheme Nursery at Hedigalla be closed down and the Rubber Research Institute was to take over this nursery as a budwood nursery as from 1967.

Estimates were prepared by the Estate Superintendent in keeping with requirements for conversion of the existing nursery to a budwood nursery. These estimates were approved.

REVIEW OF THE R.R.I.C. SUB-STATION, KURUWITA

By

B. COCKING

Acreage :

	A.	R.	P.
Mature polyclonal	20	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
— do — 1966	10	0	00
Uprooted for replanting in 1967	10	0	00
Nurseries	1	3	24
Roads, deniya and buildings	23	0	10
Total ..	247	2	30

A further 10 acres have been replanted during 1966 in hand-pollinated clones and a further 10 acres have been uprooted and cleared for replanting in 1967. Thus, we have only just over 20 acres of the original stand of old polyclonal rubber left for replanting in 1968 and 1969. The nurseries have been extended by ½ acre to establish a 1966/68 seedling nursery. 64 acres of the 1961 clearing is now in partial tapping.

Staff :

Mr. M. C. Perera was confirmed in his appointment as Senior Field Assistant in May. Mr. Amarapala, Rubber-maker/K.P., left our services in August since when Mr. M. C. Perera has been obliged to undertake these duties in addition to his own. New staff appointments are still pending.

Weather :

Comparative Figures for 1965 and 1966

	1965	1966
January	4·31	10·91
February	4·68	1·98
March	7·77	12·16
April	15·53	15·34
May	32·42	7·13
June	9·69	10·85
July	5·21	8·12
August	30·88	9·35
September	18·31	18·63
October	15·08	18·03
November	9·61	8·08
December	9·39	3·67
	162·88	124·25

The South West monsoon was very mild this year and the last two months of the season also tended to be dry. Conditions during this year were generally good for tapping but certainly not ideal for planting.

Crop :

	1965	1966
Estimated ..	26,000 lb	19,500 lb
Secured ..	48,491 ,,	33,796 ,,

The estimated crop was again substantially exceeded. The harvests from the partial tapping of the 1961 clearing had not been estimated. Yields from the polyclonal areas on 150% for the third year, exceeded 1,000 lb an acre, and in any event, 1966 was a good year for rubber harvests.

Tapping :

	1965	1966
Estimated cost ..	25·00	24·00
Actual cost ..	21·93	26·20

Cost of tapping has risen steeply this year due to low initial intakes from the 1961 — 64 acre clearing which was brought into tapping in January. However, average intake was 11·51 for the year and tappers' out-turn was over 99% which is very satisfactory.

The standard of tapping in the 1961 clearing is good.

Weeding :

Weeding in the old polyclonal areas was restricted to two rounds of cheddy clearing whilst normal monthly rounds were maintained in the 1961 clearing. Estimate was slightly overspent by Rs. 14·74.

Buildings :

All staff bungalows were colour washed during the year and the roof of the Senior Field Assistant's bungalow was painted. Factory, office and store rooms were fully repaired and whitewashed and the twelve cottages for labourers were also whitewashed and roofs tarred.

Roads :

The main cart road and all field roads continue to be well maintained and useful cattle gates have been constructed at both the Paradise and Gonapitiya approaches to the Sub-station and sign boards have been erected indicating our inlet roads along the main Ratnapura/Avissawella road.

Manufacture :

Latex crop continues to be manufactured as smoked sheet whilst scrap grades are despatched unmanufactured. Our overall sales average for 1966 was 82½ cts. per lb. Out-turn of No. 1 sheet was 90% but we have been without a Rubber-maker since August. Machinery and factory are both in good order.

Curing cost estimated	— 8·50 cts. per lb
— do — spent	— 7·00 — do —
Fuel for power estimated	— 8·30 — do —
— do — spent	— 7·78 — do —

Manufacturing costs are well below estimate.

Labour :

Labour statement as at 31st December, 1966

Working men	9
— do — women ..	8
Non-working adults ..	20
— do — children ..	37
Total ..	74

The labour force has worked well during the year and there has not been any unrest. A number of ex-Paradise labourers left our employment during the year.

Clearings :

Replanted 1962 — 1965 = 98A 1R 33P

All these clearings are growing well and the 1962 — 38¾ acres should be ready for tapping early in 1968. Eradication of *Mikania* in low-lying areas has again proved expensive and over-expenditure on weeding amounted to Rs. 4·50 per acre per month.

Advertisements are accepted on the understanding that the Institute accepts no responsibility for the claims made therein.