Report of the Work of The Rubber Research Board in 1946

The present report is the sixteenth Annual Report of the Rubber Research Scheme (Ceylon) as constituted under the Rubber Research Ordinance (Chapter 302).

CHAIRMAN'S REPORT

Board Membership.—The three-year period of the following nominated members of the Board terminated during the year and appointments to fill the vacancies were made as indicated below :

Mr. T. Amarasuriya, 19th May	Mr. Noel de Silva, nominated
Hon. Mr. G. E. de Silva, 13th July	Renominated.
Mr. R. C. L. Notley, 28th July	Renominated.

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

Mr. G. R. Whitby resigned and Mr. Simon Abeywickreme was nominated in his place from 1st March.

Mr. R. P. Gaddum resigned and Mr. W. H. Attfield was nominated in his place from 6th March.

Mr. E. W. Whitelaw returned to Ceylon and resumed membership on 21st March relieving Col. K. D. H. Gwynn.

Mr. R. J. Hartley resigned and Mr. A. W. Harrison was nominated in his place from 15th April.

Mr. H. E. Peries, Acting Deputy Financial Secretary, was nominated to represent the Financial Secretary from 26th April, in place of Col. C. J. D. Lanktree.

Mr. E. W. Whitelaw resigned and Mr. C. A. C. Bowen was nominated in his place from 17th July. Special reference was made to the valuable services rendered by Mr. Whitelaw during his long period of membership.

Mr. Thomas Amarasuriya was nominated on 15th October, in place of the late Mr. R. C. Kannangara. Reference was made to the death of Mr. Kannangara and to the valuable services rendered by him over a long period of membership.

The personnel of the Board at the end of 1946 was as follows :

Ex-officio Members:

The Director of Agriculture—(Mr. L. J. de S. Seneviratne, C.C.S.); Representing the Financial Secretary—The Deputy Financial Secretary (Mr. H. E. Peries, C.C.S.).

Unofficial Members of the State Council nominated by H.E. the Governor:

The Hon'ble Mr. G. E. de Silva, M.S.C.
Mr. Simon Abeywickreme, M.S.C.
Mr. Thomas Amarasuriya, M.S.C.

Members nominated by the Ceylon Estates Proprietary Association;

Mr. E. J. O. Richardson,
Mr. W. H. Attfield,

Members nominated by the Planters' Association of Ceylon:
Mr. F. H. Griffith, M.S.C.
Mr. R. C. L. Notley.

Members nominated by the Rubber Growers' Association:
Mr. A. W. Harrison.
Mr. C. A. C. Bowen.

Members nominated by the Low-Country Products Association of Ceylon:
Mr. W. Neal de Alwis, J.P.
Mr. A. M. Clement Dias.
Mr. Noel de Silva.
Mr. F. J. C. de Mel.

Members nominated by H.E. the Governor to represent smallholders:
Mr. W. P. H. Dias, J.P.
Mr. F. A. Obeyesekere.

Meetings.—Meetings of the Board were held in Colombo on 21st January, 1st April, 24th June, 17th July, 11th November, and at Dartonfield on 19th December.

Committees:

Experimental Committee.—Mr. A. M. Clement Dias acted for Mr. W. P. H. Dias for a brief period. The personnel of the Committee at the end of 1946 was as follows:

Mr. F. H. Griffith, M.S.C. (Chairman).
Mr. W. P. H. Dias, J.P.
Mr. R. C. L. Notley.
Mr. F. A. Obeyesekera.
Mr. Noel de Silva.
The Acting Director (Convener).

Meetings of the Committee were held on 4th January, 25th March, 10th June and 16th September.

Smallholdings Committee.—There were no changes in the membership of the Committee which, at the end of the year, was as follows:

Mr. W. P. H. Dias, J.P.
Mr. F. A. Obeyesekere.
The Smallholdings Propaganda Officer.
The Acting Director (Chairman and Convener).

A meeting of the Committee was held on 4th January.

London Advisory Committee for Rubber Research (Ceylon and Malaya).—The Board contributed equally with the Imperial Institute to the cost of research on the quality and utilisation of raw rubber carried out at the Imperial Institute under the control of the London Advisory Committee for Rubber Research (Ceylon and Malaya). Meetings of the Advisory Committee and of the Technical Sub-Committee were held on 31st May and 27th September, 1946.

Future Development—An amending Ordinance providing for an increase in the rate of cess from $12\frac{1}{2}$ to 25 cents per 100 lbs. for a period of ten years from 1947 received the Governor's assent.

FINANCE

Income.—The Board's main income was derived from the cess of 1/8th cent per pound on exports of rubber under Section 6 (1)*a* of the Rubber Research Ordinance. Income from this source exceeded the estimate for the year by Rs. 5,257-20.

Monthly cess collections were as follows:

January...	Rs.	19,017·37	Brought Forward	Rs.	140,691·32
February	,,	25,430·34	July	,,	8,639·42
March ...	,,	34,122·59	August	,,	28,140·55
April ...	,,	21,535·13	September ...	,,	32,914·25
May ...	,,	19,065·90	October	,,	27,931·23
June ...	,,	21,519·99	November ...	,,	26,232·45
			December ...	,,	20,707·98
	Rs.	140,691·32		Rs.	285,257·20

A profit of Rs. 22,413·73 was derived from the normal working of Dartonfield Estate and Rs. 6,587-25 from Nivitigalakele.

Expenditure.—Current expenditure amounted to Rs. 347,944·50 showing a deficit for the year of Rs. 11,233·39.

Capital expenditure amounting to Rs. 136,700·92 was incurred mainly in respect of Agricultural Development Rs. 18,644·71, Construction of School and Creche, Chummery for Research Assistants, Cottages for Peons, etc. Rs. 72,293·50, Hedigalla Cart Road Rs. 31,808·20, Water and Power Supply Rs. 4,250·77 and Laboratory Apparatus Rs. 9,703·74.

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

Technical Reports.—The Director's Report, which embodies the reports of the other officers, and the report for 1946 of the London Advisory Committee for Rubber Research (Ceylon and Malaya) are attached.

(Sgd.) L. J. SENEVIRATNE,
Chairman of the Board,
RUBBER RESEARCH SCHEME (CEYLON).

April, 1947.

ACTING DIRECTOR'S REPORT

The year 1946 which was to have been the beginning of a period of expansion proved in the event to be one of the leanest years in the history of the Scheme. Mr. T. E. H. O'Brien, Director, had to resign on account of ill-health soon after his return from leave, and only two technical officers were on duty throughout the year, out of a scientific and administrative staff of eight.

With such a depleted staff research activities had to be severely restricted. The advisory services were maintained as fully as possible and the long-term field experiments already set up were continued, but comparatively little new work was undertaken.

The present abridged report includes a summary of the activities of each department, compiled by the officers concerned.

STAFF

Director.—Mr. T. E. H. O'Brien returned from overseas leave on 12th February but his health rapidly deteriorated and he finally retired on medical advice with effect from 5th July. Appreciation of Mr. O'Brien's services to the Scheme over a period of 25 years was placed on record by the Board. Mr. M. W. Philpott was in charge of the Scheme during the Director's absence on leave and after his retirement.

Chemical Department.—Mr. M. W. Philpott combined the duties of Chemist with those of Acting Director.

Botanical Department.—Following the resignation of Mr. C. C. T. Sharp and Dr. C. E. Ford at the end of 1945, Mr. C. A. de Silva, Assistant Botanist, was left in charge of the botanical work. Mr. de Silva was on duty throughout the year except for one month during September and October.

Mr. C. G. Hansford accepted the post of Mycologist about the middle of the year and took up his duties on 22nd October.

Soils Department.—Dr. L. A. Whelan, Soil Chemist, was on overseas leave from the beginning of the year. He returned to duty on 8th October.

Smallholdings Department.—Mr. W. I. Pieris, Smallholdings Propaganda Officer, was on sick leave for about two months; otherwise he was on duty throughout the year.

Estate Department.—Mr. G. P. N. de Silva, Estate Superintendent, took one month end-of-contract leave in November/December. Otherwise he was on duty throughout the year.

Headquarters Office.—Mr. C. D. de Fonseka, Secretary-Accountant, was granted overseas study leave with effect from 18th March until the end of the year (returned to duty on 28th February, 1947).

Research Assistants.—Ceylonese graduates were invited to apply for four posts in the three research departments of the R.R.S. The Board's intention was to employ the Assistants for two years prior to sending them abroad at the Board's expense for further study and training. The posts were advertised twice during the year but the response was poor. The only candidate of suitable calibre later withdrew his application. As the terms of these apprenticeships are very generous it can only be concluded that men of the required type are not at present available in Ceylon.

CHEMICAL DEPARTMENT

M. W. Philpott

Little progress was made in the chemical research programme because the Chemist was occupied with administrative and secretarial duties. In order to keep the laboratory staff usefully employed one assistant was attached to the Government Rubber Technologist and another was seconded to the Soils Department.

Variability and the Improvement of Hevea by Selection.

In last year's report it was shown that rubbers obtained from different trees vary widely in plasticity. Estimates were given of the extent of the variation and evidence was adduced to show that plasticity, and hence any property associated with it is genetically controlled.

It was hoped to extend these variability studies in 1946 to include properties such as tensile strength, resilience and rate of vulcanisation, but the investigation had to be postponed because of the staff shortage.

Estate Manufacture.

Sole Crepe.—The high premium for sole crepe led to a large influx of enquiries about the technique of manufacture. Few estate factories in Ceylon are adequately equipped for making sole crepe and the question that most frequently arises is how to make the best use of available machinery. Assistance by the Department had to be limited to occasional visits to estate factories, and to the issue of a leaflet outlining the main procedure used in making sole crepe.

Latex.—Many producers applied for detailed information on the preparation of latex for shipment. The small scale creaming plant at Dartonfield was kept in operation throughout the year, partly for demonstration and partly to supply the local demand for creamed latex. Advice was given on the design and construction of the first large commercial plant to be set up in Ceylon.

The creaming properties of latex preserved with sodium pentachlorphenate (SB) were studied in comparison with those of ammoniated latex. It was concluded that latex preserved with SB 0·3 per cent. and NH_3 0·1 per cent. creams satisfactorily with tamarind seed extract; and that the creaming capacity is not improved by storing or by the addition of soap.

An attempt was made to devise a rapid method for the analytical determination of sodium pentachlorphenate in latex but the work had to be set aside before the initial difficulties were overcome.

Fermented Sheet.—Plans were made for constructing a maturing chamber suitable for producing fast curing sheet in small commercial quantities. The object was to provide an atmosphere of high humidity at 38°+1°C. which is the temperature most favourable for the maturing process. Unfortunately the work had to be stopped before the chamber was perfected.

Purified Rubber.—Low protein rubber was made on a small factory scale by treating freshly ammoniated latex with soap and then washing out the non-rubber constituents by multiple creaming. In this way nitrogen-contents were reduced to about 0·03 per cent. or less. The effectiveness of the preliminary soap treatment for displacing the surface proteins is illustrated in Table I.

Table I.

Removal of Protein by Treatment with Soap followed by multiple creaming

Rubber from	Nitrogen Content of Rubber, per cent.	
	Without Soap	With Soap
1st Cream	0·24	0·16
3rd ,,	0·16	0·06
6th ,,	0·10	0·03

Latex thus purified was difficult to coagulate smoothly because of its extreme sensitiveness to electrolytes, but fairly satisfactory coagulation was obtained by adding a suspension of 0·5 per cent. (on the rubber) of sodium fluosilicate.

Control of Plasticity.

Because of its technical importance the plastication of rubber has received more attention than the converse process of hardening or stiffening. Many softeners or "peptisers" are recognised but comparatively few stiffening agents. Yet there is evidence that the hardening and softening of rubber by chemical agents are related processes.

One of the substances occasionally used in industry to stiffen masticated compounded rubber is benzidine, but no attempt seems to have been made to elucidate its mode of action nor to discover the structural features common to substances which reduce the plasticity of rubber.

An enquiry into the action of stiffening agents springs naturally from the study of variation in the plasticity of plantation rubber; for it is at least conceivable that the observed variations are related to the presence

in varying amounts of plasticity-modifying constituents. Whether this is so or not the control of plasticity is of sufficient technical importance to warrant a closer study of the hardening-softening relationships of rubber under the influence of chemical agents.

It was found that concentrations of benzidine as low as one molecule per 50,000 isoprene units produced a detectable reduction in the plasticity of raw rubber. The presence of 0·1 to 0·4 per cent. of the reagent increased the tensile strength more than tenfold and greatly reduced the solubility of the rubber in the usual solvents (Table II).

Table II.

Properties of Raw Rubber containing Benzidine			
	Plasticity D_{10}	Tensile Strength kg/cm_2	Per Cent. Insoluble in Benzene
Control	4·23	4·5	4·8
With Benzidine	6·6	63·0	88·0

In general, aromatic substances containing at least two primary amino-groups (not necessarily in the same benzene ring) were found to be stiffening agents. Phenylenediamines and their homologues, benzidine, diaminophenols, pp' diaminodiphenylmethane, salvarsan, and certain dyestuffs were among the active substances examined. Benzidine was inactivated by acetylation and by the introduction of sulphonic groups into the 3,3' positions. Methyl—and methoxy—groups in these positions (as in o-tolidine and o-dianisidine) only slightly reduced the activity of the reagent. Among the phenylenediamines the order of decreasing activity was meta-para-, ortho-, the latter being almost inactive. Some of the more complex diamines (*e.g.*, Bismarck Brown and Fuchsine) caused stiffening only on prolonged storage, or on heating with rubber at a moderately elevated temperature (60°). Rubber samples containing the simpler diamines (phenylenediamine, benzidine, etc.) were already hard when freshly prepared and did not suffer any appreciable further loss of plasticity on heating.

In latex rubber the stiffening action was found to be markedly affected by the hydrogen ion concentration, low PH tending to destroy the activity of the reagents. It was also noticed that formaldehyde slightly impaired the activity of p-diamines and completely suppressed that of o- and m-diamines.

Nitranilines exhibited a positive stiffening effect but were less active than the corresponding diamines. Dinitrobenzenes appeared to be mild softening agents (Table III).

Table III.

Replacement of Amino- by Nitro Groups	
Reagent	Plasticity (D_{10})
None-Control	3·85
m-Phenylenediamine	5·17
m-Nitraniline	4·78
m-Dinitrobenzene	2·48

No general interpretation of these observations can be offered at this stage. It is not known whether the reagents themselves enter into the cross-linked structure or whether they induce other types of cross-linking, or indeed whether the observed physical changes can be truly ascribed to cross-linking. In this connection it may be noted that benzidine as such cannot be fully recovered by alcohol extraction from benzidine-treated rubber: about 90% appears to remain strongly bound.

The opposing influences of amino- and nitro- groups suggest that stiffening action may be connected with the presence of electron-repelling groups in the reagent, and softening with electron-attracting groups. The significance of the hydrogen ion effect may be that the reagents only exercise their stiffening action in the non-ionized form.

Although these observations may be of more theoretical than practical interest it is possible to envisage a number of technical applications for stiffening agents of the type considered. For example:

(1) To control the plasticity of commercial rubber.
(2) In sole crepe to improve physical properties or reduce creep.
(3) To give added strength to latex films without the use of vulcanising agents or the application of heat.
(4) To stabilise purified rubber (already covered by B.P. 570563).
(5) In rubber cements: the strength of the film deposited by evaporation of solvent is much enhanced if the cement contains benzidine or phenylenediamine.
(6) In latex impregnated paper, to give added strength.

Meteorological Observations.

The weather summary for 1946 is shown below:

	1946.	...	1945.
Rainfall (ins.)	158·0	...	134·9
Highest monthly rainfall (ins.)	24·7 (Dec.)	...	29·1 (Oct.)
Highest daily rainfall (ins.)	7·49 (28-4-46)	...	6·55 (28-10-45)
Highest shade temperature (day)	94·2°F (11-3-46)	...	94·7°F (23-25-2-45)
Lowest temperature (night)	63·8°F (5-1-46)	...	60·8°F (26-1-45)
Number of rainy days	244	...	210

BOTANICAL AND MYCOLOGICAL DEPARTMENT

C. A. DE SILVA

(C. G. Hansford, from October).

Oidium.—In the low-country the incidence of Oidium leaf disease was relatively light. At Dartonfield where wintering began early in February a few intermittent showers delayed defoliation. Most of the trees refoliated without Oidium infection but a mild attack developed during the latter part of February, and a few wintering trees were severely attacked in March. Trees of a clone in test-tapping at Dartonfield were completely defoliated as late as April.

Phytophthora Leaf Disease.—A heavy secondary leaf fall due to Phytophthora occurred in August. Characteristically, defoliation on most estates was localised within small pockets of infection.

Brown Bast.—The high incidence of Brown Bast in young budded rubber still remains a matter for some concern. There is evidence of a connection between the development of Brown Bast about the end of the third tapping year in certain high-yielding clones and the tapping system employed in the early tapping years. The Brown Bast experiments referred to in the last report have been continued for 18 months since May, 1945. Various methods of scraping and "tapping off" of diseased areas with periods of resting and applications of disinfectants were tried on 50 budded trees in a series of factorial combinations of the various treatments. Up to the end of 1946 only 9 cases had sufficiently recovered to resume tapping; these recoveries can hardly be attributed to any particular combination of treatments. It would appear that the conclusions drawn from the results of light scraping treatment by the late Mr. H. W. R. Bertrand (R.R.S. Combined Quarterly Circular for 1945) were somewhat premature.

Planting Material.

Studies of Clones and Seedling Families.—1,884 trees were test-tapped at Nivitigalakele and Dartonfield, consisting of 195 local and foreign clones, over 400 seedlings from the Prang Besar and Tjikadoe isolated seed gardens, and a small number of local illegitimate seedlings.

The original buddings of 6 selected new clones derived from Prang Besar seedlings gave an average yield of 11 lb. per tree per annum in the fifth tapping year. The 6 clones were planted in a large scale clone trial at Hedigalla. Four clones established from Tjikadoe seedlings gave yields better than the best of the control clone Glenshiel 1. 14 original buddings of the two local clones MK. 3/2 and WG. 6278 which are recommended for large-scale planting gave 22·9 lb. and 23·2 lb. per tree for the tapping year 1945-46 respectively at approximately 15 years of age, the average for over 70 trees of both clones being 15 lb. per tree per annum in the same tapping year.

The results of test-tapping (Morris-Mann) the 1939 hand-pollinated seedlings and derived clones at Nivitigalakele (1941 clearing) revealed, many individuals giving early yields in excess of the control clone WG. 6278. This area will be taken into regular test-tapping in 1947. Five illegitimate seedlings of MK. 1/1 and four of MK. 3/2 yielded more than 20 gms. of rubber per tree per tapping in the second tapping year; the best gave 45 gms. per tapping.

New Trials.—Just over 100 seedlings from the 1943 programme of hand pollinations were planted out at Hedigalla in a randomised block layout with clone TJ. 1 as a control. Derived clones of 5-tree plots from each seedling were planted in an adjacent area with the same control clone.

The planting of a large-scale clone trial at Nivitigalakele was completed in October; the trial comprises 7 foreign clones (AV. 255 and 352; PR. 107; PB. 5/60 and 6/9; CHM. 2 and 3) with clone TJ. 1 as a control. Clones PB. 5/60 and PB. 6/9 were included on account of their promising early test-tapping yields at Dartonfield, while the growing local interest in clones CHM. 2 and CHM. 3 warranted their early inclusion in this large-scale trial. The experimental layout provides a total area of approximately 3 acres for each clone.

No. 3 Replanting Experiment, Dartonfield (1936).—In this experiment three methods of establishing bud grafts in the field are compared. Girth measurements taken in May, 1945 and June, 1946 are summarised in Table I. together with the yields for 1946. The stumped buddings were first tapped in March, 1942, the budded stumps in December, 1942, and the field buddings in December, 1943.

During the first three tapping years (1942-1944) the stumped buddings yielded about 1,000 lb. per acre and the budded stumps 500 lb. per acre more than the field buddings. These excess yields persisted in 1946, but to a diminishing extent.

Table I.

	Age June 1946	Mean Girth in Inches			Yield in grams per tree per tapping 1946
		1945	1946	Increase 1945/46	
Stumped buddings ...	10 years	26·53	28·29	1·76	23·0
Budded stumps ...	10 ,,	25·39	27·33	1·94	21·2
Field buddings ...	9¾ ,,	22·22	24·21	1·99	16·0
Sign : diff : (·01) ...		1·44	1·44		

Breeding.—As a result of the highly successful pollination programme carried out by the Geneticist in 1945 over 5,000 seedlings are available for planting out. These hand-pollinated seedlings together with the small clones which will be established from them, will require over 250 acres for testing. As many as possible will be planted at Hedigalla in 1947/1948 and the remainder will be distributed to estates. No further pollination work will be undertaken until this material has been planted out.

Stock Experiment, Dartonfield, 1941.—In this experiment 5 clones of RRM. '500' series were budded on 5 different illegitimate seedling families, and on unselected seedlings. The budgrafts were planted in June, 1941, sub-blocks consisting of 6 single tree plots of the various stocks being replicated sixteenfold within each monoclonal block. Unbudded seedling stumps of these stocks were planted in 6 tree sub-blocks, with the same number of replications.

Girth measurements taken in June showed that the differential effect of the various stocks on growth of scion was not of any practical importance. Differences in growth of some of the unbudded stock families remained significant as in the previous year. The growth of seedlings of clones AV. 163 was outstanding and incidentally the budded stocks of this clone showed the best growth of scion, although the differences observed were not statistically significant.

Tapping Experiments.

Mature Seedling Rubber, Dartonfield, 1937.—The ninth year of this tapping experiment was completed in February and the results were published in the Combined Quarterly Circular for 1946. A further drop in yield from 111·4 to 101·8 per cent. of the control occurred in the double-three system. The interpretation of the continued decline in this system with its higher bark consumption is somewhat complicated by the fact that yields are now influenced by differences in average heights of tapping cuts and maturity of bark. The results of the final year ending in February, 1947 considered in relation to the average tapping heights may indicate the beginning of a real deterioration. Meanwhile we can say that over the nine year period the double-three system has given 17 per cent. excess yield over the control, S/2, d/2, the figure being statistically significant.

The general trend over the 9-year period indicates that increased yields can be expected from the double-four as compared with the alternate day half spiral system, the former incidentally being the cheaper tapping system.

Tapping Experiment No. 14 (Ladder Tapping).—This experiment was started on old seedling Rubber at Dartonfield in August, 1944. The double-three system adopted during the war period is compared with (*a*) double-three plus a half circumference V cut at 8 feet from the ground tapped downwards with the aid of a ladder and (*b*) double-three plus a half circumference V cut opened on virgin bark just above the tapping panel and tapped upwards. In March, 1946 the tapping system was changed from double-three to double-four in keeping with general estate practice and the comparisons were carried on as before. A summary of the yields as a percentage of the control 2S/2, d/3, 133% or 2S/2, d/4,100% are given in Table II.

Table II.

Period	2S/2-½ V/2 (ladder) *d/3,200%			2S/2-½ V/2 (upwards) *d/3,200%		
	Lower cuts	Upper cuts	Total	Lower cuts	Upper cuts	Total
August, 1944 to July, 1945	87	56	143	80	56	136
August, 1945 to July, 1946	87	60	147	73	55	128
August, 1946	95	66	161	85	53	138
September, ,,	85	64	149	81	52	133
October, ,,	82	62	144	82	49	131
November, ,,	88	60	148	76	49	125

*Changed from March, 1946 to d/4, 150%.

The increased yields of 43 and 36 per cent. in the first tapping year are statistically significant. In the second tapping year the increased yield from 'upward' cuts of 28 per cent. just fails to reach the required standard, the significant difference (P=0·05) being 29 per cent. In order to make a complete study of the effect of the 'ladder' and 'upward' cuts on the yield of the two normal cuts tapped downwards, the experiment will be continued till the end of the third tapping year. The incidence of Brown Bast in this experiment has been negligible.

Budded Rubber Tapping Experiment No. 5, Dartonfield, Clones.

Gl. 1, AV. 256, P.B. 25.—Trees were planted in 1934 as budded stumps and the area first came into tapping in 1941. The experiment consists of 4 tapping systems on single tree-plots randomised with 64 replications in each of the three monoclonal blocks. The yields in pounds per tree per annum are given for the first 5 years in Table III. together with the girth increment figures for 1945/46.

In the fifth year of tapping clone Gl. 1, the very satisfactory yield on S/3, d/2 of the previous year was repeated, but with a fair number of Brown Bast cases on the new panels which were opened the year before. The reduction in intensity of the two 100 per cent. systems to 50 per cent. effectively checked the high incidence of Brown Bast. The S/4, d/2, 50% system did exceptionally well giving 10 lb. per tree per annum, confirming the very high-yielding qualities of Gl. 1. The 50 per cent. intensity tapping

TABLE III.

Tapping Experiment No. 5, Budded Rubber.

Mean yield in pounds dry rubber per tree per annum and as per cent. of S/2, d/2, 100%.

Clone	Original Tapping System	1941-42	1942-43	1943-44	1944-45	1945-46	New B.B. cases 1945-46	Total B.B. cases 1942-46	Mean girth increment in inch 1945/46
Gl. 1	S/2, d/2, 100%	5·47 (100)	6·57 (100)	8·26 (100)	4·28**	10·08	3	45	2·1
	S/3, d/2, 67%	4·44 (81)	5·37 (82)	6·84 (83)	9·29	9·57	13	24	2·6
	S/2, d/3, 67%	4·07 (74)	6·02 (92)	8·33 (101)	5·80	12·31	5	23	1·7
	2S/2, d/4, 100%	5·07 (93)	6·30 (96)	10·18 (123)	5·14***	5·22	1	30	2·3
AV. 256	S/2, d/2, 100%	3·13 (100)	4·39 (100)	5·37 (100)	5·25 (100)	5·68 (100)		8	1·9
	S/3, d/2, 67%	2·40 (77)	3·39 (77)	4·22 (79)	4·20 (80)	4·45 (78)	1	2	2·0
	S/2, d/3, 67%	2·24 (72)	3·26 (74)	*5·95 (166)	6·23 (119)	7·97 (140)		16	1·3
	2S/2, d/4, 100%	3·39 (108)	4·96 (113)	6·73 (125)	5·31 (101)	6·70 (118)		12	1·5
PB. 25	S/2, d/2, 100%	3·70 (100)	5·56 (100)	6·30 (100)	4·97 (100)	7·60 (100)	6	12	2·6
	S/3, d/2, 67%	2·75 (55)	4·28 (77)	4·69 (74)	4·45 (90)	5·21 (69)	1	6	3·0
	S/2, d/3, 67%	2·66 (72)	4·12 (74)	*10·26 (163)	7·65 (154)	9·54 (127)	1	11	2·2
	2S/2, d/4, 100%	3·50 (95)	6·00 (108)	7·61 (121)	5·95 (120)	7·65 (102)	2	8	2·4
Mean No. of tappings on S/2, d/2, 100%		125	138	150	134	141			

*Changed to 2S/2, d/3 133%—March, 1943.
**Changed to S/4, d/2, 50%,—Sept. 1944.
***Changed to S2, d/4, 50%.

with the longer interval is apparently unsuitable. With 5 years' experience of tapping this clone we now recommend starting it on S/2, d/3, 67%, taking care not to force the yields unduly by any form of deep tapping during the early years. The yield of 12·3 lb. per tree per annum on S/2, d/3 in the fifth year would indicate that this system could be permanently adopted for this clone.

The most interesting feature in clones AV. 256 and PB. 25 was the very satisfactory yield obtained on 2S/2, d/3, 133% introduced in the third year, with little or no incidence of Brown Bast. This opens up the possibility of tapping some of the more robust older clones to give yields which compare favourably with those obtained from the newer high yielding clones tapped normally. These older clones have also given satisfactory yields on double-four tapping system.

From girth increment figures given in the last column of Table III it will be noted that even in the fifth year of tapping there are indications that increased yields in general have been obtained at the expense of growth. This effect is more marked in the early years of tapping when the trees can put on from $3\frac{1}{2}$" to 4" girth increase per annum.

SOILS DEPARTMENT

L. A. WHELAN

The Soil Chemist was absent on furlough from 1st January to 9th October. During his absence the essential work of the Department was carried out by the Assistant Botanist.

(1) Fertiliser Rationing.—Allotments for 1947 were calculated on receipt of returns from estates. The basis of the quota is the same as in previous years except that Rubber planted in 1939 is classed as "mature' for 1947 issue. 213 late returns were attended to for 1946 issue and 843 for 1947 issue.

(2) Dartonfield Experiment on Manuring Mature Rubber, 1936.—Tapping was on the double-three system until March when a change was made to the double-four.

The mean yields for the year in kilograms of dry rubber per plot of 20 trees on the basis of one experimental tapping per month were :

		O.	N.	NP.	NK.	NPK.
Actual yield		5·02	6·66	5·80	6·51	7·05
Adjusted yield*		5·36	6·63	5·84	6·37	6·85
Adjusted yield as percentage on control	1946 ...	—	124	109	119	128
	1945 ...	—	118	106	109	116
*Standard error		·243				
Significant difference :						
Odds ... 19 : 1... ...		·71				
Odds ... 99 : 1... ...		·96				

As in previous years, nitrogen alone seems to be the most economic treatment. Phosphate added to nitrogen has brought about a significant decrease in yield.

Comparison between fertiliser broadcast and fertiliser forked in :

Broadcast	5·71	adjusted yield
Forked	6·71	,, ,,
Standard error		·216
Significance difference (odds 99 : 1)		·97.

The increase in average yield per plot from 5·48 kilograms in 1945 to to 6·21 in 1946 may be partly due to the change in tapping system. The sharp increase in the response to manures, as shown by the percentage figures above, is of greater interest. The small and fairly consistent responses over the first nine years of the experiment were obtained on bark formed before the fertiliser programme was started or in its early years. The larger responses of 1946 may be a result of tapping bark formed after the start of the programme. The same argument may be applied to the response to forking. Forking was carried out in 1936, 1937, 1939 and 1941 and then discontinued.

(3) Experiment on Young Rubber :

(*a*) *No. 2 Manuring Experiment (Budded Rubber)—Dartonfield*, 1938.—The trees showed an average increment of 2·97 inches girth for the twelve months up to June, 1946, but no significant differences between fertiliser treatments.

The number of tappable trees (18 inches at 3 feet) in June, 1946 is given below as a percentage of total trees per treatment :

O.	N.	P.	K.	NP.	NK.	PK.	NPK.	Compost
87	83	96	73	98	91	98	96	100

Suitable trees were first taken into tapping in March, 1944 and further trees were added in September and March every year. The total yields in kilograms of dry rubber (exclusive of scrap) for each treatment on the basis of one sample tapping per month from March, 1944 to December, 1946 are :

	O.	N.	P.	K.	NP.	NK.	PK.	NPK.	Compost
Total (kilograms) ...	21·1	17·1	33·8	15·5	40·8	27·4	38·9	38·9	35·1
Per tree per tapping (grams) ...	16·0	14·5	16·5	13·6	15·7	15.1	15·8	15·4	14·4

Although it is too early to draw conclusions from this experiment it is interesting to note that the highest yield per tree per tapping has to date been given by trees manured with phosphate (Saphos) only.

(*b*) *No. 15 Manuring Experiment (Phosphate Placement)—Hedigalla*, 1948.—This experiment which was started 3 years ago to compare the effects of applying phosphatic manures in different ways has so far shown that better results are obtained by mixing the fertiliser with surface soil than by concentrating it in balls at a depth of 6 inches.

	Saphos		*Superphosphate*	
	Concentrated	*Distributed*	*Concentrated*	*Distributed*
Girth in inches	8·63	9·86	9·78	10·13
Significant difference	·43		Not significant.	
	(odds 99 : 1)		(odds 19 : 1)	

There is an indication that the response to superphosphate is greater than that to rock phosphate.

(*e*) No. 16 *Manuring Experiment* (*Phosphate Level*)—*Hedigalla*, 1944. —Girth measurements were made in October, 1946, 2½ years after planting budded stumps :

Total Saphos applied up to October, 1946			Nil	6 oz.	12 oz.	18 oz.
Girth in inches			5·75	6·38	6·50	6·75
Significant difference :	19 : 1	·24				
	99 : 1	·31				

All treatment results are significantly greater than the control. The highest rate has given a response significantly greater than the lower rates.

SMALLHOLDINGS DEPARTMENT

W. I. Pieris

The year began well for the rubber smallholder with the price of rubber standing at one rupee per pound and the weather unusually dry. The market for sheet deteriorated during the year and at the end of 1946 the price had fallen to 71 cents. Many smallholders found it difficult to understand the disparity between the prices paid for sheet and crepe, and some made enquiries about supplying their latex to sole crepe factories.

The Department maintained its usual services to Rubber smallholders throughout the year.

Visits.—The smallholdings Propaganda Officer made 21 visits of inspection to the seven Instructors' ranges. Visits to individual small estates were made from time to time by request.

Staff.—The Smallholdings Propaganda Officer was on sick leave for two months in April/May. The decision of the Board to increase the staff of seven Rubber Instructors to ten was implemented in October by the appointment of 3 additional Instructors. A fourth Instructor was appointed simultaneously for the Horana range in place of Mr. F. K. Patirage who left in November. All 4 officers were given the usual course of training before being sent to their ranges at the end of the year. The 3 new Instructors were posted to ranges as follows :

Mr. M. A. Pabilis	...	Gampaha
Mr. A. D. C. Perera	...	Akuressa
Mr. K. P. Siriwardene	...	Pitigala (near Elpitiya)

Three of the 10 Instructors now possess small cars, 2 possess motor cycles and the remaining 5 bicycles. Instructors are encouraged to acquire motor cycles for their work and several of them have been granted loans for this purpose. Instructors were on the whole well supplied during the year with tyres for their cars, thanks to the courtesy of the Tyre Controller who was interviewed on two occasions in this connection.

New Planting.—Although the supervision of New Rubber Planting Scheme holdings is now the responsibility of the Department of Agriculture, contact was maintained with the 234 tappable holdings which our Instructors visited at the Land Commissioner's request in 1945. Advice was also given to " middle-class " new-planting permit holders at the owners' request A total of 683 visits was made to 318 holdings and 2,474 tappable trees were marked and stencilled to demonstrate correct tapping methods.

Divisional Agricultural Officers of the Central, Southern and South-western Divisions were shown round the Nivitigalakele clearings and local new-planted holdings in July ; matters connected with the supervision of new-planting work were discussed.

Replanting.—There has been little replanting activity among smallholders since the end of the war. Lining for drains was undertaken by Instructors on 4 replanting holdings (9 acres) and general advice was given on 3½ acre). 558 replanted holdings were visited and 343 tappable trees were marked for demonstration.

The 7 demonstration replanted blocks which are supervised by the Department in co-operation with the owners were maintained in good order and given their annual dressing of cattle manure. Six of the blocks were tapped. The average yield for the year of the Baddegama block (clone PB. 86) was 30·4 gms. per tree per tapping which is a very satisfactory yield (over 900 lb. per acre) and an improvement on the 1945 average yield of 26·3 gms. The number of trees tapped was 70, the block having been planted with budded stumps in November, 1938 and in tapping since September, 1943. All demonstration blocks have been free of disease.

Sheet-Making and Smoke Houses.—One of the Department's main objects is to improve the quality of smallholders' rubber. To this end demonstrations of sheet-making are given in the villages, smoke-houses are built and equipment is issued.

In 1946 Instructors gave 248 sheet-making demonstrations at which the entire process was shown and explained. Mud-and-wattle smoke-houses of approved design were built by way of demonstration and propaganda on selected roadside holdings, part of their cost being borne by the owners and part by the Research Scheme. 13 demonstration and 35 private smoke-houses were started during the year and 10 demonstration and 21 private ones completed. 16 existing houses were improved by incorporating ventilation and altering internal design, etc. 3 curing sheds were started and 7 completed (including 4 started in 1945). 460 visits were paid by Instructors to smallholders' smoke-houses in connection with the improvement of sheet. 103 sq. feet of mesh for strainers were sold at the special rate of Re. 1·50 per sq. foot and 54 wooden latex pans and 19 sieves were presented free to owners who were following the Department's recommendations.

Nurseries.—Eight nurseries were opened and maintained during the year for demonstrating budding to smallholders and for supplying small quantities of budded stumps. Advice was given to the owners of 4 private nurseries. 1,577 nursery plants were budded of which 894 were successful. Owing to the shortage of cloth the buds were bandaged with coir rope over a patch of waxed tape—a method which is not always satisfactory during wet weather. 138 yards of budwood were issued to Instructors for budding nurseries and 828 budded plants were sold.

Compost.—The making of compost by smallholders with green loppings and other waste material was encouraged both by the maintenance of demonstration pits and by giving instruction on the maintenance of privately owned pits. Detailed instructions on making compost were circulated to Instructors. 42 demonstration and 17 private pits were opened during the year, a number of which were refilled and re-used after the original compost was utilised. The compost was used for manuring demonstration nurseries and replanted blocks.

Co-operation with Government Departments.—Advice was given to Dr. A. Sundralingam, Government Rubber Technologist, regarding the possibility of opening Government subsidised Central Factories for purchasing smallholders' latex and converting it into first grade sheet on a large scale. Full details were given of the Hataraliyadde Rubber Co-operative Society which was organised by this Department some years ago to enable a group of smallholders to manufacture and market their rubber co-operatively.

It was suggested to the Director of Commerce and Industries that locally made Acetic Acid should be retailed by approved dealers in sealed, labelled bottles at a fixed price.

Hataraliyadde Rubber Co-operative Society.—This Society functioned satisfactorily under the supervision of the Rubber Instructor, Katugastota, who paid 17 visits of inspection and tested the metrolac once a month. At one period the quality of the society's sheet deteriorated because some of the members started to adulterate their latex. The trouble ceased when the Instructor adopted the temporary expedient of manufacturing members' latex separately. The society's sheet otherwise fetched excellent prices throughout the year.

Shows.—The Department ran a stall at the Kegalla Food and Handicraft Exhibition in July. A competition with prizes for the best smallholder's sheet was organised and the entries were judged by the Smallholdings Propaganda Officer. The winning sheets were of good quality but the general standard was not high.

General.—In addition to the demonstrations already mentioned 43 budding, 149 marking and tapping, 118 disease control and 178 miscellaneous demonstrations were given by Instructors. Assistance in food production work was given by the Instructors at Kegalla, Katugastota and Horana. The Land Officer, Kegalla, was advised on the replanting of portions of the Urumiwela Rubber Allotments, which have been given out to villagers. Inward correspondence amounted to 584 and outward 523.

ESTATE DEPARTMENT

G. P. N. DE SILVA

Dartonfield Estate

Acreage Statement.

	A.	R.	P.
Rubber : Mature areas	112	1	28
Replanted areas ...	44	3	22
Buildings and roads	16	3	08
Scrub, etc.	2	2	19
Newly acquired land	2	1	22
Total ...	179	0	19

Rainfall.—157·98 inches.

Rainfall was below average. December rainfall was the highest ever recorded in that month. A monthly summary is given below :

	1945.	1946.	5 years average.
January	2·93 ins.	1·66 ins.	3·55 ins.
February	·57 ,,	7·84 ,,	7·07 ,,
March	16·77 ,,	9·93 ,,	11·41 ,,
April	6·88 ,,	20·25 ,,	14·88 ,,
May	14·52 ,,	7·46 ,,	24·44 ,,
June	20·93 ,,	13·48 ,,	17·69 ,,
July	6·66 ,,	8·59 ,,	8·92 ,,
August	5·01 ,,	14·79 ,,	11·46 ,,
September	9·07 ,,	11·62 ,,	13·59 ,,
October	29·10 ,,	20·65 ,,	24·64 ,,
November	15·56 ,,	17·04 ,,	17·75 ,,
December	6·93 ,,	24·67 ,,	13·97 ,,
	134·93 ins.	157·98 ins.	169·37 ins.

Crop.—Rubber harvested in 1946 amounted to 67,750 lb. or 82·6 per cent. of the estimated crop. This is 16,530 lb. less than the crop harvested in 1945. The 20 per cent. decline in yield is attributed to the change over from double-three to double-four tapping and to the reintroduction of the winter rest,

Yield records for individual fields are as follows (1945 yields per acre in brackets):

Field No.	Date of planting.	Total crop lb.	Acreage tapped.	Yield per acre lb.
1	1910	13,731	28½	482 (595)
2	1913	631	1	631 (840)
3	1917	10,031	24	418 (633)
4	1911	711	1½	474 (768)
5	1934	4,945	7½	659 (782)
6	1913	27,519	57½	479 (616)
7	1936	4,158	8¾	475 (442)
8	1938	5,776	15¾	367 (300)
9	1939	248	1	248 (352)
		67,750	145½	466 (584)

Percentage of estimate harvested = 82·6.

Tapping.—Tapping of the commercial area was changed in March from double-three to double-four. Bark consumption was approximately 3½ inches on each cut. Upward cuts were opened on otherwise worthless trees. Tapping was stopped for one month from 8th February. Tapping of the experimental areas was under the supervision of the Estate Superintendent. The Visiting Agent reported favourably on the standard of tapping. Average intake per tapper was 6·6 lb. compared with 5·9 lb. in 1945, and the average daily pay for tappers amounted to Re. 1·49 (including Special Allowance).

Manufacture.—A summary of the grades prepared during the year is given below:

Grade.		*Lb.*	*Per cent.*	*Total.*
Smoked Sheet	No. 1 ...	20,103	29·67	29·67
Latex Crepe	No. 1 ...	13,874	20·48	
,, ,,	No. 2 ...	2,328	3·44	
,, ,,	No. 3 ...	2,893	4·27	28·19
Scrap Crepe	No. 1 ...	13,851	20·45	
,, ,,	No. 2 ...	2,570	3·79	
,, ,,	No. 3 ...	1,374	2·03	26·27*
Latex ...	... ...	10,727	15·83	
Crumb Rubber	... ...	30	·04	15·87

*Includes experimental samples.

Machinery.—The Consulting Engineers, Messrs. Hammond & Co. inspected the machinery and equipment on the 11th and 12th April. Their report was satisfactory except in respect of the engines and storage batteries. On their advice a 80/90 H.P. National Engine and a new storage battery were ordered.

The new piston and liner ordered in 1945 for the 20 H.P. Gardner Engine had not been received at the end of the year.

Buildings.—Construction of the following buildings was completed during the year :—

Chummery for Graduate Assistants.
1 set quadruple cottages for minor staff.
School and Creche.
School-master's quarters.
Alteration to Botanical laboratory.
2 sets of latrines for lines.

Construction of the following buildings is in progress :—
Secretary-Accountant's Bungalow.
Junior Staff Bungalow No. 12.

Oidium.—Wintering was early and only late wintering trees were affected by Oidium. One precautionary round of sulphur-dusting and 1½ further rounds were carried out at 5 lb. of sulphur per round per acre.

Phytophthora.—A severe secondary leaf fall occurred on several parts of the estate in August.

Routine applications of water-soluble and water-proof disinfectants were made to the tapping cuts.

A summary of trees lost from various causes during the year is given below :—

Brown Bast	2
Wind Damage	41
Ustulina	21
Fomes Lamaoensis	7
Fomes Lignosus	5
Trees Cut Down near Buildings ...	59
Total ...	135

Intensively Tapped Area to be Replanted in 1947—11 Acres.—Lining and holing of this area is in progress. It is to be planted 10′ × 17′ with illegitimate seedling families according to experimental requirements.

Manuring.—Manuring of 101½ acres due for manuring was completed partly with R. 400 mixture at 200 lb. per acre and partly with R. 300 mixture at 150 lb. per acre. The area of 11 acres due for replanting in 1947 was not manured. Immature and experimental areas were manured according to requirements.

Cover Crops.—Supplying of Desmodium ovalifolium was continued.

Weeding.—Grass was eradicated, and rubber seedlings and indigenous erect plants were lopped.

Forestry Area.—The control of natural covers was carried out, according to experimental requirements. Weeding of grass was completed.

Labour.—Labour was sufficient for all requirements. 6 resident Ceylonese and 34 non-Ceylonese labourers left the estate ; 7 Ceylonese and 48 non-Ceylonese were recruited. Details of labour on check roll at the end of the year were as follows :

	Resident.	*Non-resident.*
Ceylonese	15	44
Non-Ceylonese	76	—
Average daily out-turn ...	89	
Average daily pay	Re. 1·40*	

*Including Special Allowance.

Health.—Record of sickness among staff and labour force:

Malaria	198 cases
Influenza	131 ,,
Worms	62 ,,
Ulcers	107 ,,
Anchylostomiasis	15 ,,
Miscellaneous and Minor Ailments ...	704 ,,

Visiting Agent.—The Visiting Agent, Col. K. D. H. Gwynn, inspected the estates once during the year and reported favourably on their condition.

NIVITIGALAKELE ESTATE

Acreage Statement.

Rubber:	Mature Areas (1926-1935) ...	67¼ acres
	Clearings (1939-1944) ...	46 ,,
	Replanted Area—1946 ...	21 ,,
	Nurseries and Roads ...	19¼ ,,
Uncultivated		16 ,,
	Total ...	169½ acres

Rainfall.—150·34 inches (1945—119·93 inches).

Crop.—Crop for the year was 39,534 lb. compared with 62,965 lb. in 1945 and an estimate of 51,000 lb. The reduction of crop amounting to 37 per cent. can be attributed partly to the winter rest, partly to the change over from the double-three to double-four tapping, and partly to the removal of 21 acres of mature rubber for replanting. The following is a summary of yield records for each field (1945 yields per acre in brackets):—

Clearing.	*Acreage in tapping.*	*Crop lb.*	*Yield per Acre lb.*
1926 Clearing ...	12½	9,791	783 (1,027)
1927 ,, ...	10¼	7,375	720 (1,122)
1928 ,, ...	16	7,608	476 (626)
1935 ,, ...	28	13,224	472 (458)
1939 ,, ...	6½	1,536	236 (193)
	73¼	39,534	540

Tapping.—The tapping system of the commercial areas was changed from double-three to double-four. Test tapping was on the S/2, d/2 system. Tapping was stopped on the 16th February and recommenced on the 15th March (30 days). A statement of trees in commercial and test-tapping is given below:

Clearing.	*Test-tapping.*	*Commercial tapping.*	*Immature.*	*Total.*
1926	19	1,119	—	1,138
1927	71	816	—	887
1928	168	1,151	—	1,319
1935	771	1,516	28	2,315
1939	—	906	205	1,111
	1,029	5,508	233	6,770

Average daily intake per tapper was 8·6 lb. compared with 7·8 lb. in 1945; and the average daily pay for tappers amounted to Re. 1·58 (including Special Allowance).

Manufacture.—Crop from commercial tapped areas was manufactured in the form of smoked sheet. Test-tappings amples were milled at Dartonfield and sold as scrap crepe. The distribution of grades is as follows :

Grade.		*lb.*	*Per cent.*	*Total.*
Smoked Sheet	No. 1	22,102	55·91	
,, ,,	No. 2	2,591	6·55	
,, ,,	No. 3	1,953	4·94	67·40
Scrap Crepe	No. 1	10,228	25·87	
,, ,,	No. 2	2,436	6·16	
,, ,,	No. 3	224	·57	32·60

Pests and Diseases : Bark Rot and Canker.—A number of trees were affected by bark rot and tapping canker, but damage was not extensive. Disinfectants were regularly applied.

Oidium.—One full round and two partial rounds of sulphur-dusting were carried out in the mature areas, and two rounds in the clearings.

Canker.—A round of canker scraping was done.

Trees lost from various causes were as follows :

Wind Damage	36
Ustulina	1
Trees cut down near buildings ...	55
	92

Manuring.—Mature areas were manured partly with R. 400 mixture at the rate of 200 lb. per acre and partly with R. 300 mixture at the rate of 150 lb. per acre. Immature areas and nurseries were manured according to standard recommendations.

Immature Areas.—Growth in the 1940-1945 clearings was satisfactfactory. Pruning of indigenous cover in the "No burn" clearings was completed.

Intensively Tapped Area, 21 Acres (Replanted 1946 Clone Trial).—This area was felled and replanted with budded stumps in October, according to experimental requirements. Vacancies were supplied in December.

Nurseries.—Budwood nurseries were manured and pruned according to requirements.

Seedling Nurseries.—Approximately 80,000 seedlings were planted out in vacant beds previously prepared. Some of the plants were attacked by Phytophthora. All beds were sprayed with Perenox.

Buildings.—The following buildings were completed :—

Smokehouse.
Tool and Rice Store and Factory extension.

Labour.—Labour for all works was sufficient except during the harwesting periods. Details of labour on the check roll at the end of the year were as follows :

	Resident.	*Non-Resident.*
Ceylonese	20	61
Non-Ceylonese ...	2	—
Average daily out-turn ...	65	
,, ,, pay ...	Re. 1·33*	

*Including Special Allowance.

HEDIGALLA ESTATE

Acreage Statement.

1943 Clearing	...	...	...	11 acres
1944 ,,	...	...	...	14 ,,
1945 ,,	...	...	...	25 ,,
1946 ,,	...	...	...	10 ,,
1946 ,, (Unplanted)		...	...	6 ,,
Buildings and Roads	...	...	...	5 ,,
Boundary Strips	...	...	...	20 ,,
		Total	...	91 acres

New Planting.—The balance unplanted in 1945 was planted with Dartonfield clones.

Clone Trial 1946 (16 Acres).—About 10 acres were planted with seedlings and budded stumps. Holes $2\frac{1}{2}' \times 2\frac{1}{2}' \times 3'$ deep were cut; lining on the contour $30' \times 10'$. The area left unplanted will be planted in 1947.

Immature Areas.—Growth in the areas planted in 1943-1945 was satisfactory.

Manuring.—The young areas were manured according to programme.

Green Manure.—Cuttings of Desmodium ovalifolium were planted out and are spreading well.

Buildings.—Completed during the year:
1 K.P.'s quarters.

1947 Planting (40 to 60 Acres).—Felling of this area was started in December.

Cart Road.—Cutting of the $1\frac{1}{2}$ mile section was completed and a further $\frac{1}{2}$ mile is under construction; this brings the road into the clearings and up to the Conductor's bungalow. The road was badly damaged by carts and large lorries transporting firewood and timber for the colonists and others. Repairs were carried out on the damaged section.

Food Production

Areas under cultivation for food crops were as follows:

Nivitigalakele	$\frac{1}{2}$ acre
Hedigalla	40 acres

Crops harvested during the year:

Paddy	29 bushels
Sweet Potatoes	434 lb.
Manioc	14,754 lb.
Yams	49 lb.
Pine-apples	2,584

Advisory Services, Etc.

The volume of advisory correspondence was approximately the same as in previous years. Many enquiries on the botanical side were about the choice of planting material, methods of clearing, and the tapping of budded and seedling rubber. Among the enquiries on pathological subjects were included a fair number on Brown Bast, Pink Disease and Phytophthora. Much of the Soil Chemist's correspondence was on the subject of fertiliser rationing; but there was also an increase in the number of enquiries on the general economy of manuring old rubber. The Chemical Department received requests for advice on a wide range of subjects, notably on the manufacture of sole crepe and the preparation of latex for shipment.

With only two scientific officers on duty for the greater part of the year, estate visits had to be curtailed. The Acting Director made 6 advisory visits to estates and the Acting Botanist 10.

Advice was given to several Government Departments. By arrangement with the Director of Commerce and Industries, the Government Rubber Technologist was stationed at Dartonfield from 10th July and was given access to the Scheme's laboratories and technical records.

Meetings, Committees, Etc.

The Director or Acting Director attended meetings of the Rubber Research Board by invitation, and served on the Experimental Committee the Smallholdings Committee and the Staff Salaries sub-Committee.

The Acting Botanist represented the Research Scheme at one meeting of the Central Board of Agriculture. Meetings of the Fertiliser Rationing Committee were attended either by the Acting Director or by the Soi-Chemist.

The Director or Acting Director represented the Scheme at meetings of the Planters' Association of Ceylon, the Kalutara Planters' Association, the Ceylon Estates Proprietary Association and the Low-Country Products Association.

The Acting Director attended the Annual Sessions of the Ceylon Association of Science, and addressed the Chemical Society of Ceylon on "The Elastic Properties of Rubber."

Co-Operation With Other Research Associations.

Co-operation was maintained with the London Advisory Committee for Rubber Research (Ceylon and Malaya) by correspondence and the exchange of reports. Special reference may be made to the Committee's services in 1946 in connection with the selection and appointment of a Director, a Mycologist and a Botanist. Thanks are also due to those members of the Committee who contributed expert criticism and advice on the late Geneticist's review of the Oidium problem.

The scientific staff in Ceylon look forward to renewing contacts with the staff of the Rubber Research Institute of Malaya who have doubtless been fully occupied in 1946 with the task of restoring the rubber advisory facilities in Malaya. It is also hoped that good news will soon be forthcoming of the sister Research Institutes of the Netherlands East Indies.

Reports were exchanged with the British Rubber Producers' Research Association and the Rubber Growers' Association. Co-operation was maintained with the Tea Research Institute in connection with fertiliser rationing, and with the Coconut Research Scheme on matters of common interest.

Publications were exchanged with scientific organisations in different parts of the world ; a considerable number of new organisations applied to be registered for the receipt of publications.

Publications.

Publications of the Research Scheme are issued without charge to the Proprietors (resident in Ceylon), Superintendents and local Agents of Rubber estates over 10 acres in extent, who apply for registration. Extra copies are supplied for the use of Assistants on large estates. Particulars of issues of publications are given below :

	1945.	1946.
Estates and Agencies	935	959
Subscribers	44	51
Exchange List	57	65

Publications issued during the year were as follows:

Report of the Work of the Rubber Research Board in 1945.
Advisory Circular No. 20—Supplement (May, 1946).
Combined 3rd and 4th Quarterly Circulars for 1945.
Field Experiments on Dartonfield Estate XXVIII. L. A. Whelan.
Yields of Budded Rubber and Clonal Seedlings in Commercial Tapping. C. C. T. Sharp.
Description of a Method and Apparatus to keep Gl. 1 leaves free from attack by Bats. E. C. K. Minor.
Combined Quarterly Circulars for 1946.
Field Experiments on Dartonfield Estate XXIX. C. A. de Silva.
Stand per Acre of Budded Trees in Commercial Tapping. C. C. T. Sharp.
Selected Natural Covers in Young Budded Rubber. G. Huntley.
Observations in a No-Burn Clearing at Nivitigalakele. L. A. Whelan and C. A. de Silva.

Reviews:

"Chemicals, Humus and the Soil." L. A. Whelan.
"Post-War Preparation and Packing of Rubber." M. W. Philpott.

(Sgd.) M. W. PHILPOTT,
Acting Director.

Research Laboratories,
Dartonfield, Agalawatta,
21st March, 1947.

LONDON ADVISORY COMMITTEE FOR RUBBER RESEARCH (CEYLON AND MALAYA)

ANNUAL REPORT, 1946

GENERAL ADMINISTRATION

Finance.—This is the last year in which the Imperial Institute and the Rubber Research Scheme, Ceylon will share the cost of the work of the London Advisory Committee who wish to place on record their high appreciation of this substantial financial assistance during a very difficult period.

The present financial arrangement has functioned since the fall of Malaya and cannot be expected to continue now that Malaya is again exporting rubber on a large scale. The routine testing of washed rubber, latex and lower grades of plantation rubber, on behalf of the Rubber Directorate, will also come to an end very shortly, and the Board of Trade will then cease to make any contribution to the cost of the junior staff and subsidiary services.

Accordingly, proposals have been submitted to the Boards of the Rubber Research Organisations in Ceylon and Malaya for them to share in the same proportions, as in pre-war years, the financial provision for the Committee's research and agency work. Unfortunately, increased costs and the urgent need for more detailed study of mechanical properties have made it necessary to request that the amounts subscribed should be more than doubled. The Board of the Rubber Research Scheme, Ceylon, has already agreed to this request, and in November an *ad hoc* Estimate Committee of the Rubber Research Institute of Malaya recommended the Board to pay the increased

contribution. Under the new arrangements the Committee will continue to have the benefit of the laboratory and other facilities which the Imperial Institute has made available for rubber research for many years.

Staff in Ceylon and Malaya.—It was reported last year that five members of the senior staff employed by the Rubber Research Institute of Malaya had been killed or had died as a consequence of the Japanese war. Eleven of the survivors have now returned to Malaya leaving thirteen vacancies to be filled. These have been widely advertised throughout the Empire and many applications received by the Committee, but, on the whole, the quality of the candidates has been disappointing. The more promising candidates were interviewed by a Selection Committee. By the end of the year only eight had been recommended for appointment, of whom four have since withdrawn. Applications continue to be received intermittently and arrangements have been made to interview candidates at intervals.

That the Malayan organisation should pass through a period of staff changes and shortages is not unexpected, but that the Rubber Research Scheme, Ceylon, should experience the same trouble is more of a surprise. The only members of the senior staff who remain are the Chemist and Soils Chemist. Recommendations have been made and accepted for the filling of the Botanical and Mycological vacancies, but the Committee have unfortunately not been able to find a suitable Geneticist. New developments in the production of high-yielding trees largely depend upon genetical work. The advice of leading Geneticists in Great Britain has therefore been obtained as to how best the post can be made more attractive.

Rubber Research in the East has suffered a further loss in that the respective Directors of the organisations in Ceylon and Malaya have both resigned. Mr. T. E. H. O'Brien, of Ceylon, has been compelled to retire on account of ill health after nearly 25 years' service. A successor has been recommended by the Committee and the recommendation accepted. Mr. H. J. Page, of Malaya, has resigned to accept the position of Principal of the Imperial College of Tropical Agriculture, Trinidad. The Chief Secretary to the Governor of the Malayan Union has asked the Committee to recommend a successor. The vacancy has been widely advertised, and a recommendation was made at the end of the year.

London Committee.—Two changes have been made during the year. Mr. G. Brown, who represents Ceylon planting interests, has resigned and has been replaced by Mr. E. W. Whitelaw, who was, until recently, a member of the Board of the Rubber Research Scheme, Ceylon.

Sir Harold Tempany ceased to represent the Colonial Advisory Council of Agriculture, Animal Health and Forestry on retirement from Government Service and the Council has nominated Dr. H. H. Storey, F.R.S. to succeed him. It is hoped to retain Sir Harold's services as a co-opted member. Dr. D. F. Twiss, Chief Chemist to the Dunlop Rubber Co., has also retired after 25 years as a very active member of the Technical sub-Committee. He has been replaced by Dr. W. C. Davey of the same company.

The Committee and Technical sub-Committee held three meetings during the year. In addition there were meetings of *ad hoc* sub-Committees, chiefly for the purpose of recommending staff appointments for Eastern organisations.

London Staff.—A Committee of Enquiry was appointed by the Board of Governors of the Imperial Institute to consider the qualifications, salary scale, and work of their staff, and, with the approval of the London Advisory Committee, the enquiry was extended to the rubber staff. A report was issued recommending that the senior members should be placed in the appropriate scientific officer grades described in the Government White

Paper CMD. 6679, that equipment should be improved, that the laboratories should be contiguous and that the junior staff should be replaced, when possible, by more highly qualified employees. The Committee expressed their appreciation of the report and agreed to accept the recommendations, subject to a further consideration of details in the light of prevailing circumstances when they arise.

Co-operation With Other Organisations.—During the early part of the year, while the Malaya staff were on recuperation leave, they not only frequently visited the Imperial Institute for individual talks on technical matters, but also held a formal meeting to discuss war-time research in Ceylon. The meeting was attended by the London Senior Staff, and it was fortunate that the Director of the Rubber Research Scheme, Ceylon was also able to be present.

The British Rubber Producers' Research Association at Welwyn Garden City held meetings to discuss progress in the fundamental physics and chemistry of natural rubber and allied materials. Attendance at these meetings was sometimes difficult during the war but is now being given priority.

Co-operation with the Research Association of British Rubber Manufacturers has also been improved by holding regular meetings of the senior staffs to discuss in detail the work at the Imperial Institute, Many useful suggestions have arisen out of these discussions and the minutes of the meetings are circulated to the London Advisory Committee as well as to the staffs of the organisations in the East.

The Superintendent represented the Rubber Growers' Association on the Rubber Industry Committee and various sub-Committees of the British Standards Institution. This Committee supervises the standardisation of testing methods and the preparation of technical specifications on behalf of the whole of the British Industry and is now revising and expanding a comprehensive set of specifications for testing vulcanised rubber (B.S 903).

The staff took an active part in the affairs of the Institution of the Rubber Industry and attended meetings of Council, Finance Committee, Education Committee, Examinations Board and Local Section Committee. They also attended meetings of the London Section of which the Senior Assistant continued to act as Hon. Secretary.

RESEARCH

Quality of Rubber.—The chief object of the work of the Committee's staff is to indicate how commercial rubber from natural sources can be improved in quality. Since natural rubber is an end-product of biological synthesis and is fundamentally the same whatever the botanical source, the possibility of producing, by agricultural methods from Hevea, and elastic material with a new chemical structure is remote. It is known, however, from work in Ceylon that certain trees continue to produce hard, some others soft types of rubber and that these characters tend in some respects to be transmitted to their offspring. It is also known that commercial rubber can be separated into fractions which differ in hardness and solubility, Moreover, evidence has been obtained during the year, both in Ceylon and London, that the hardness of rubber can be increased or decreased through the agency of small quantities of chemicals, some of which are present as normal impurities in commercial rubber. Although the structure of Hevea rubber hydro-carbon whatever its source is fundamentally the same, it is evident that there are limited possibilities of producing different materials in accordance with limits of the variations so far experienced,

The fundamental chemistry of rubber and allied materials suggests that the main causes of the difference between hard and soft rubber are variations in molecular size and in the degree of cross-linking or other type of molecular association. Evidence has been produced during the year that both factors are responsible, and that they differ in their technical importance.

If hardness and softness merely depend upon molecular weight, it would be expected that mastication, which reduces the hard and soft rubbers to the same level of plasticity and is the first step in the preparation of the finished article, would eliminate differences due to molecular size. In agreement with this expectation it has been found at the Imperial Institute that after vulcanization there is no significant difference between the rubber from the trees which yield hard and those which yield soft rubber.

It has been found in Ceylon that hard rubbers tend to become softer on keeping and soft rubbers harder. There may, therefore, be some levelling of molecular differences before the rubber is tested in London, but it is only partial, and what remains is apparently not important in the vulcanised product. The experimental work is so far somewhat limited and a more detailed study is desirable before arriving at firm conclusions.

That the difference between freshly prepared hard and soft rubbers is not the same as that between the easily-soluble soft fraction and the more difficultly-soluble hard fraction of commercial rubber is shown by the fact that while the former difference apparently disappears on mastication and vulcanisation, the latter difference does not.

Evidence has been obtained by other workers that so-called sol and gel rubbers retain their differences after vulcanisation, but the experiments have generally been open to the criticism that the gel rubber is much less pure than the sol rubber and that the impurities could be responsible for the differences observed. Only within recent years has a simple method of purification been devised at the Imperial Institute which does not depend upon strong chemicals to destroy the non-rubber impurities and which thorefore runs less risk of effecting changes in the rubber hydrocarbon. This purified rubber is appreciably softer than the corresponding whole rubber, but it still yields the same relative proportions of sol and gel fractions. After vulcanisation the mechanical properties of the two fractions are markedly different.

It is believed that the difference between sol and gel rubber is allied to the changes which occur in the plasticity of rubber through the agency of small quantities of chemical groups some of which are present in the normal impurities of natural rubber. In last year's report a section was devoted to work on peptisers on softening agents. This year the work has been extended to include a study of hardening agents. In the case of one combination of artificial hardening agents, the effect was so marked that the rubber was undoubtedly physically vulcanised after the treatment given. Vulcanisation is due to chemical cross-links in the molecular net-work, so that it is not unreasonable to assume that the same factor is responsible on a less intense scale for hardening which may occur in some circumstances. For example, rubber from ammonia-preserved latex is harder and less soluble than that from fresh latex.

Preliminary investigations suggest that hardening and softening agents ultimately owe their effects to oxygen which may cause either chain linkage (hardening) or chain scission (softening). In the circumstances a study of the oxidation-reduction potentials of the various agents employed should yield valuable information, and an investigation along these lines was commenced towards the end of the year.

The work on hardening agents was partly inspired by the Chemist to the Rubber Research Scheme, Ceylon, who has been making a detailed study of the plasticity of rubber for several years, particulars of which have not yet been published. Both hard and soft rubbers have technical advantages for different purposes, and the control of plasticity is probably more important still. If artificially hardened and softened rubbers are similar to the gel and sol fractions of commercial rubber, they should exhibit considerable differences in the mechnical properties of the vulcanised material. This is a matter of practical importance and will be studied in 1947.

For many years studies of variability in rubber were mostly concerned with the effect of non-rubber substances on rate of vulcanisation without regard to the fact that they may be responsible for changes in the rubber hydrocarbon before vulcanisation occurs. An attempt has now been made to reduce the vulcanisation effects of the non-rubber impurities and to determine whether they still have mechanical effects on the vulcanised product. Because more than 50% of commercial rubber is used in tyres, special attention has been given to tyre tread mixes, modified to eliminate vulcanisation effects as far as possible. The non-rubber impurities were softened from preserved latex and included not only those in the aqueous phase but also those associated with the rubber particles. They were separated into crude fractions depending upon their solubility in various solvents. On adding the separate fractions, alone, and in various combinations, to purified rubber the inert ingredients, which had no effect on the course of vulcanisation, were found to act as diluents. They tended to weaken and soften the rubber, to reduce its resilience and its resistance to abrasion and tear. The ingredients, which were known to be active vulcanising accessory agents, were less harmful and, in some directions, effected a slight improvement. On the whole, there was no indication that they produced a special effect which could not be more suitably achieved by the controlled addition of well-known commercial accessory vulcanising agents.

The conclusion from these experiments is that purified rubber is technically superior for tyres over normal commercial rubber, but the improvement is not outstanding and is probably not worth the cost of purification or the risk of deterioration, which is very marked in purified rubber. The experiments suggest, however, that any method of treatment which reduces the inert non-rubber substances without adding to the cost is desirable. This is an almost impossible task as removal of a substantial proportion of impurities must lead to a reduced yield which is necessarily associated with a higher cost except in the unlikely event of a saving in processing costs.

It is of interest in this connection that some well-known tyre manufacturers prefer rubber containing an excess of natural impurities, and it is still possible that some of these impurities are responsible for slow changes in the rubber hydro-carbon on keeping, particularly in the presence of oxygen, and that they effect technical improvements which are retained when the rubber is purified. In these circumstances, purification of fresh latex in the East would result in a product inferior to purified rubber prepared in London.

It is evident that it would be premature, at this stage, to recommend purification as a technical aim for general purposes. Priority must first be given to a study of the changes in plasticity and solubility which occur in the presence of natural and artificial impurities and to the effect of these changes on the properties of the vulcanised material.

The investigations into the effect of non-rubber substances on the mechanical properties of vulcanised rubber have required statistical planning and analysis of the results. Considerable attention has also had to be

given to the details of testing methods, some of which have been improved during the year. Measurements of resistance to tear and to abrasion are still somewhat unreliable, but steps have been taken to improve both these tests by next year. The separation of the hard and soft fractions of rubber is also unsatisfactory and is being studied further.

For some time now the London Advisory Committee has emphasized that the cost of production is of vital importance in determining the extent to which natural rubber will succeed in competition with synthetic materials. Much of the cost is due to labour charges which have increased considerably since the war. The bulk of the labour is employed in tapping and field work. The labour charges for processing and packing are much less. Nevertheless, labour is scarce and small economies are worth while. The London staff have, therefore, given much attention to the development of the mechanical continuous process of coagulating, washing and drying and packing of rubber referred to in last year's report. Progress has been slower than expected because of the difficulty of obtaining materials. The laboratory apparatus has, however, been sent to Malaya for trial there and a pilot plant has been partially erected at the Imperial Institute. The coagulating and washing units of the plant are now in operation, but the drying unit is still in the course of erection. The experience gained has disclosed some of the mechanical difficulties likely to be encountered on estates, and experiments and modifications of the plant are in progress to ensure trouble-free operations.

As the process depends upon the preparation of the rubber in thin films, it was considered that drying by infra-red radiation might be suitable, but preliminary experiments indicated that the cost was excessive even if it is assumed that a cheap source of electricity is available. Most of the other experiments have been concerned with the production of films of uniform thickness, particularly at the edges where tearing is most likely to start; and also with the mechanical removal of water (or serum) so that the coagulum can be dried with the minimum expenditure of fuel. It is hoped that the pilot plant will assume practical form during 1947 and that it can then be shipped to Malaya.

Quality of Preserved Latex.—Considerable attention has been given in previous years to the quantitative distribution of non-rubber substances in preserved latex, *i.e.*, to determining which substances are in the aqueous serum phase, which in the rubber particles and which are at the boundary of rubber and serum. All the preserved latex available is now very old and the investigation has been handicapped by the absence of fresh material. Supplies of freshly preserved latex were in transit from the Rubber Research Institute of Malaya at the end of the year.

Two old samples preserved with sodium pentachlorphenate together with a little ammonia and with sodium pentachlorphenate alone were re-examined. Little change had occurred since their previous examination in 1941. This type of latex keeps much better than ammonia-preserved latex which develops large quantities of ammonium salts responsible for processing difficulties when compounded with zinc oxide.

A study has also been made of the distribution of phosphorus and mineral matter in these two latices. An appreciable amount of both were found to be associated with the rubber or rubber boundary phase. More than half the mineral matter was due to potassium and phosphorus compounds and to sodium pentachlorphenate. The latter was fairly evenly distributed between the serum phase and the rubber or rubber boundary phase.

Many small samples of latex from recent commercial consignments were examined on behalf of the Rubber Directorate of the Board of Trade. This is the first occasion on which it has been possible to apply the results of pre-war studies to determine the quality of commercial latex. It was shown that all the samples were of poor quality. The results indicated that the samples were mostly centrifuged concentrates which had been prepared some time ago, probably in the early days of the Japanese occupation.

Pre-war studies shewed that nitrogenous matter (protein) could be removed from the surface of rubber particles by treatment with soap (potassium oleate). Towards the end of the year a chemical comparison was commenced of the aqueous serum fractions of soap treated and untreated ammonia-preserved latex so as to determine whether surface active materials, other than proteins, were displaced from the surface of rubber particles. The evidence so far indicates that a complex mixture of organic compounds in addition to protein is present at the surface of rubber particles and is displaced by potassium oleate. The nature of these surface-active materials has not yet been determined.

Rubber Directorate.—The routine examination of samples of washed rubber and latex on behalf of the Rubber Directorate was continued during the year. The Imperial Institute Inspectors at washing depots have now been withdrawn and the quality of the washing controlled by the examination at the Imperial Institute of samples supplied by the depots. It is likely that the examination of washed rubber will continue into 1947, but that it will come to an end some time during the year.

It may be necessary to continue to carry out routine examination of latex until other arrangements can be made.

AUDITOR GENERAL'S REPORT FOR 1946

Audit Office,
Colombo, 21st October, 1947.

The Chairman,
Board of Management,
Rubber Research Scheme,
Peradeniya.

The accounts of the Rubber Research Scheme (Ceylon) for the year ended December, 31st, 1946 were audited under my direction. The financial statements :

(*a*) Dartonfield Estate Working Account ;
(*b*) Nivitigalakele Experiment Station Working Account ;
(*c*) Revenue Account, Capital Account and General Balance Sheet ; and
(*d*) Provident Fund Working Account ;

were compared with the books and accounts and found to agree. The statements are returned herewith duly certified

I. INCOME

2. The total income for the year amounted to Rs. 336,711/-. It fell short of the estimate by Rs. 13,686/- and was less than the income of the previous year by Rs. 8,795/-.

3. The following is a comparison between the estimated and the actual income under the different accounts ; short notes of reasons for the excess or deficit are given under "Remarks."

Income for 1946.

	Estimate Rs.	*Actual Income* Rs.	*Excess* Rs.	*Deficit* Rs.	*Remarks*
1. Cess Collections ...	280,000	285,257	5,257	—	Under estimate
2. Interest ...	18,500	18,705	205	—	do
3. Sale of Publications	750	1,031	281	—	More publications sold.
4. Profit from Dartonfield	27,537	22,414	—	5,123	Smaller crop realised.
5. Profit from Nivitigalakele ...	22,110	6,587	—	15,523	Smaller crop realised due to change of tapping system.
6. Sundry Receipts ...	1,500	2,565	1,065	—	Rent of bungalow and lab. equipment to Govt. Rubber Technologist.
7. Sale of Food Crops, Hedigalla ...	—	152	—	—	
	350,397	336,711	6,808	20,646	

4. **Profit from Dartonfield Estate.**—The profit for the year under review was Rs. 22,414/- as against Rs. 29,767/- in the previous year.

5. **Profit from Nivitigalakele Experiment Station.**—The working of the experiment station for the year under review showed a profit of Rs. 6,587/- compared with Rs. 29,296/- in the previous year.

II. EXPENDITURE

6. **Revenue Expenditure.**—The total expenditure on revenue account, exclusive of the amounts allowed for Depreciation of Fixed Assets and Audit Fee Reserve, amounted to Rs. 327,541/- as compared with Rs. 324,702/- for the previous year. The details of this expenditure are fully set forth in the Revenue Account. The whole of this expenditure was checked with supporting vouchers and accounts.

7. **Capital Expenditure.**—The expenditure incurred on fixed capital assets during the year amounted to Rs. 136,701/- as compared with Rs. 51,166/- for the previous year. The details of this expenditure are shown in the Capital Account.

8. A comparison between the approved estimates and the expenditure incurred during the year is shown in statement " A " attached. The reasons for the major variations between the estimates and the actual expenditure as furnished by the Director, are shown against the respective items in the statement.

III. CAPITAL ACCOUNT

9. The total expenditure on Capital Account at 31-12-45 was Rs. 865,586/-. During the year under review capital expenditure amounted to Rs. 136,701/- less a sum of Rs. 200/- being proceeds of sale of an Underwood typewriter bringing the total capital cost at 31-12-46 to Rs. 1,002,087/-.

IV. BALANCE SHEET

(*a*) Liabilities.

10. **Creditors—Rs. 23,397/-.**—Of this amount Rs. 1,298/- represents the amount due to the London Advisory Committee, Rs. 21,829/- represents the amount due to creditors for goods purchased or services rendered during the year and Rs. 270/- represents subscriptions for 1947 publications received in advance.

11. **Passage Fund Reserve—Rs. 796/-.**—The balance on December 31, 1945 was Rs. 11,544/- and a sum of Rs. 6,000/- was transferred to this fund during the year. A sum of Rs. 16,748/- was utilised during the year in connection with the sea and air passages of the members of the Senior Staff. This reduced the total to the credit of the Fund to Rs. 796/-.

12. **Depreciation Reserve—Rs. 213,160/-.**—This sum represents the amount set apart for the depreciation of the fixed assets of the Scheme. The amount transferred from Revenue to this Account during the year was Rs. 18,438/-. made up as follows :

Dartonfield.	Rs.	Cts.
Buildings at 3½% on Rs. 187,098/00	6,548	43
Furniture, Fittings and Office Equipment at 7½% on Rs. 22,840/54	1,713	04
Water and Power Supply at 7½% on Rs. 26,516/51 ...	1,988	74
Machinery and Tools at 7½% on Rs. 53,991/51	4,049	37
Accumulators at 20% on Rs. 2,994/06	598	81

	Rs.	Cts.
Nivitigalakele.		
Buildings at 3½% on Rs. 34,246/39	1,198	62
Furniture, Fittings and Office Equipment at 7½% on Rs. 2,485/03	186	39
Water and Power Supply at 7½% on Rs. 3,681/27 ...	276	10
Machinery and Tools at 7½% on Rs. 3,677/94	275	85
Hedigalla.		
Buildings at 3½% on Rs. 14,128/79	494	51
Furniture, Fittings and Office Equipment at 7½% on Rs. 525/84	39	44
Water and Power Supply at 7½% on Rs. 163/29	12	25
Laboratory Apparatus at 7½% on Rs. 14,092/22	1,056	92
	18,438	47

The value of buildings at Dartonfield Estate for purposes of depreciation would appear to be Rs. 187,357/15 and not Rs. 187,098/- on which depreciation has been calculated. This point is being referred to the Director for comments.

13. **Provident Fund Reserve—Rs. 161,322/-.**—The balance to the credit of the Fund at the end of 1945 was Rs. 145,676/- and additions during the year under review amounted to Rs. 29,250/-. A sum of Rs. 13,604/- was paid out to the officers who retired during the year.

14. **Medical Fund—Rs. 1,204/-.**—The balance to the credit of this Fund at the end of 1945 was Rs. 5,565/- and additions during the year under review amounted to Rs. 3,441/-. A sum of Rs. 1,266/- was paid out to the officers during the year.

15. **Audit Fee Reserve—Rs. 1,204/-.**—The amount to the credit of this account at the beginning of the year was Rs. 1,344/- and that provided for the year 1946 was Rs. 850/-. Payments during the year in respect of service for 1945 amounted to Rs. 990/-.

16. **Reserve for Stabilisation of Income—Rs. 202,281/-.**—No additions to this Reserve were made during the year under review.

17. **Appreciation of Investments—Rs. 21,819/-.**—This represents the amount by which the Investments had appreciated in value as at 31-12-46.

18. **Surplus Account—Rs. 75,648/-.**—The surplus at the beginning of the year was Rs. 222,037/-. To this was added a sum of Rs. 430/- being the value realised by the sale of a Typewriter and the accumulated depreciation thereon lying in the Depreciation Reserve Account. After deducting Rs. 10,118/- and Rs. 136,701/- on account of excess of expenditure over income in 1946 and contribution to capital outlay respectively, the balance in the Surplus Account at 31st December, 1946 was Rs. 75,648/-.

(*b*) **Assets.**

19. **Debtors—Rs. 49,404/-.**—This represents cess collections for December, 1946 amounting to Rs. 27,122/- and sundries amounting to Rs. 22,282/- which were outstanding at 31st December, 1946. The former has since been received in full.

20. **Advance Accounts—Rs. 1,251/-.**—Of this amount Rs. 1,091/- represents advances to the Superintendent of Dartonfield, Nivitigalakele, Hedigalla and Smallholdings Propaganda Officer for sundry expenses. The amounts shown are the balances with them at 31-12-46. The amount shown against the Postmaster-General represents the sum deposited with him in respect of trunk-call and other telephone services.

21. **Accrued Interest on Investments—Rs. 383/-.**—This sum represents the amount of interest accrued for the year on the investments, but not received during the year. This has since been recovered.

22. **Payments in Advance—Rs. 1,443/-.**—This represents certain expenditure incurred in respect of the year 1947 during 1946.

23. **Stocks—Rs. 10,880/-.**—The balances of the estate stocks, rubber chemicals and softened rubber at the end of the year were Rs. 4,503/-, Rs. 4,212/- and Rs. 2,166/- respectively. The balance of the estate stocks was made up as follows :

	Rs.	Cts.
Dartonfield.		
Rice and Provisions	869	35
Stores	2,847	37
Materials Used for Latex Export	545	40
Nivitigalakele.		
Rice and Provisions	240	74
	4,502	86

These balances at the end of the year were not verified, but a test verification of the stock in hand at Dartonfield on 19th September, 1947, was made during the audit inspection with satisfactory results.

24. **Loan to Hataraliyadda Co-operative Society—Rs. 1,600/-.**—Of the sum of Rs. 1,900/- outstanding at the beginning of the year a sum of Rs. 300/- was repaid during the year.

25. **Investments—Rs. 591,819/-.**—Details of this amount are shown in the Balance Sheet in terms of the Middle Market Value at 31-12-46. The certificates in support of the investments were seen.

26. **Cash Balances—Rs. 50,583/-.**—Details of this figure are shown in the Balance Sheet. The Pass Books in respect of the Savings Bank Accounts were seen. The balances in current accounts Nos. 1 and 2 were verified by reference to Bank Certificates and Reconciliation Statements. The balance of cash in hand at December 31st, 1946, was not verified, but a surprise verification of the cash in hand was made on 17-9-47.

V. GENERAL

27. The accounts were received quarterly and audited in this office. The office of the Scheme at Dartonfield Estate was visited once in respect of the accounts for the year under review and the books and accounts kept were checked and cash in hand verified.

(Sgd.) P. W. KAULE,
for Auditor-General.

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1946.

LIABILITIES

	R. C.	R. C.
CREDITORS :—		
Advance Account Overdrawn :		
London Advisory Committee...	1,298 55	
Sundries	21,828 71	
Subscriptions for 1947 publications received in advance	270 00	23,397 26
PASSAGE FUND RESERVE :—		
At December 31, 1945...	11,544 02	
Additions during 1946...	6,000 00	
	17,544 02	
Less Payments in 1946	16,748 31	795 71
DEPRECIATION RESERVE :—		
At December 31, 1945...	194,951 49	
Add Reserve for 1946	18,438 47	
	213,389 96	
Less Depreciation on one typewriter sold ...	230 00	213,159 96
PROVIDENT FUND RESERVE :—		
At December 31, 1945...	145,675 82	
Additions during 1946...	29,250 03	
	174,925 85	
Less Payments in 1946	13,603 50	161,322 35
MEDICAL FUND :—		
At December 31, 1945...	5,565 32	
Additions during 1946...	3,440 98	
	9,006 30	
Less Payments in 1946	1,265 80	7,740 50
AUDIT FEE RESERVE :—		
At December 31, 1945...	1,343 93	
Add Reserve for 1946	850 00	
	2,193 93	
Less Payments in 1946	989 81	1,204 12
RESERVE FOR STABILISATION OF INCOME :—		
At December 31, 1945...		202,280 78
APPRECIATION OF INVESTMENTS		21,818 75
SURPLUS ACCOUNT :—		
At December 31, 1945...	222,037 39	
Add Realised Value and Depreciation Written off on 1 typewriter	430 00	
	222,467 39	
Less Excess of Expenditure over Income in 1946 ...	10,118 09	
	212,349 30	
Less Contribution to Capital Outlay	136,700 92	75,648 38
		707,367 81

ASSETS

	R. C.	R. C.
DEBTORS :—		
Cess Collections for December, 1946 and Arrears ...	27,121 70	
Sundries	22,281 92	49,403 62
ADVANCE ACCOUNTS :—		
Estate Superintendent :—		
Dartonfield ... ... Rs. 731·61		
Nivitigalakele ... ... ,, 1·64		
Hedigalla ... ... ,, 216·15	949 40	
Small-holdings Propaganda Officer	141 47	
Postmaster-General	160 00	1,250 87
ACCRUED INTEREST ON INVESTMENTS		383 32
PAYMENTS IN ADVANCE		1,442 79
STOCKS :—		
Estate Stocks	4,502 86	
Rubber Chemicals	4,211 65	
Softened Rubber	2,165 58	10,880 09
Loan to Hataraliyadda Co-operative Rubber Curing and Sales Society, Ltd., at 31st December, 1945 ...	1,900 00	
Less Amount Repaid	300 00	1,600 00

	Face Value R. C.	Middle Market Value at 31-12-46 R. C.
INVESTMENTS :—		
In Ceylon Govt. 3½% Loan, 1957/62	25,000 00	25,968 75
Do 3¼% Loan, 1949/51	190,000 00	197,125 00
Do 3 % War Loan, 1956/60 ...	20,000 00	20,650 00
Do 3¼% Home Defence Loan, 1952/53...	65,000 00	67,437 50
Do 3½% National Loan, 1964/69 ...	70,000 00	73,500 00
Do 3¼% National Loan, 1956 ...	100,000 00	104,500 00
Do 3 % National Loan, 1953/54 ...	35,000 00	36,137 50
Do 2½% War Loan, 1954	50,000 00	51,500 00
Do 3% Defence Loan	15,000 00	15,000 00
	570,000 00	591,818 75
CASH BALANCES :—		
At Ceylon Savings Bank		9,755 07
On Savings Deposit (Bank of Ceylon)		11,058 22
In Current Account No. 1		28,485 85
In Current Account No. 2		1,033 14
In Hand		256 09
		707,367 81

The accounts of the Rubber Research Scheme above set forth have been audited under my direction. I have obtained all the information and explanations that I have required and I certify as a result of this audit that, in my opinion, the Balance Sheet is properly drawn up so as to exhibit a correct view of the affairs of the Scheme subject to the observations in the accompanying report.

Audit Office,
Colombo, 21st October, 1947.

(Sgd.) P. W. KAULE,
for Auditor-General.

DARTONFIELD ESTATE

WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1946.

Dr.

			Cr.	
General Charges	23,369 34		By SALES :—	
Upkeep, Manufacture and Distribution	24,191 48	47,560 82	Manufactured Rubber (67,750 lbs.)	58,791 55
,, LOSS ON CARTING ACCOUNT		19 07	Preserved Latex	55,314 58
,, PRESERVED LATEX :—				4,106 13
Value of Latex	43,793 52		,, Food Crops	16 50
Incidental Expenses	4,065 20	47,858 72	*Less* Expenditure	1 67
				14 83
Balance transferred to Revenue Account		22,413 73	,, SUNDRY RECEIPTS :—	
			Creping Charges on outside rubber	100 00
			Creaming Charges on 20,537·80 gallons Latex ...	10,252 77
				10,352 77
			Less Expenditure...	6,621 39
				3,731 38
		117,852 34		117,852 34

NIVITIGALAKELE EXPERMENT STATION

WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1946.

Dr.

	R. C.	R. C.	*Cr.*	R. C.	R. C.
To EXPENDITURE :—			By SALE OF PRODUCE :—		
General Charges	12,369 06		Rubber (59,534 lbs.)	31,431 72	
Upkeep, Manufacture and Distribution	10,779 88	23,148 94	Planting Material	2,650 21	34,081 93
Upkeep of Nurseries		3,862 19	,, Food Crops	45 59	
Handling and Distribution of Budwood and Budded Stumps		488 17	*Less* Expenditure	40 97	4 62
,, Balance transferred to Revenue Account		6,587 25			
		34,086 55			34,086 55

PROVIDENT FUND

WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1946.

Dr.

	R. C	*Cr.*	R C.	R. C.
To Payment to 7 Retiring Officers	13,603 50	By Balance Brought Forward from 1945		145,675 82
,, Balance Carried Forward	161,322 35	,, Board's Bonus for 1946	10,874 89	
		,, Interest on Officers' Contributions	2,789 52	
		,, Interest on Board's Bonus	3,426 05	17,090 46
		,, Bonus Paid to 1 Retiring Officer (1945)		878 12
		,, Interest for 1946 Paid to 6 Retiring Officers ...		104 58
		,, Members' Contributions during 1946		11,176 87
	174,925 85			174,925 85

RUBBER RESEARCH SCHEME (CEYLON)

REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1946.

Dr.	Rs. C.	Rs. C.	*Cr.*	Rs. C.	Rs. C.
To Personal Emoluments :—			By Balances of Estate Working accounts :—		
Senior Scientific Staff	71,249 36		Dartonfield	22,413 73	
Junior Scientific Staff...	16,673 62		Nivitigalakele	6,587 25	29,000 98
Office Staff	17,270 49	105,193 47			
			,, Cess Collections		285,257 20
,, Library and Publications :—					
Library	1,098 58		,, Interest		18,704 78
Publications	1,825 40	2,925 98			
			,, Sale of Publications		1,030 83
,, Small-holdings Work :—					
Salaries and Allowances	22,524 22		,, Sale of Food Crops at—		
Travelling and General Expenses	9,386 61	31,910 83	Hedigalla	1,734 34	
			Less Expenditure	1,582 01	152 33
,, Laboratory :—					
Equipment and Working Expenses	6,550 10		,, Sundry Receipts :—		
Furniture Replacements	31 85	6,581 95	General	2,424 58	
			Sale of Vulcanised Products ...	4,974 11	
,, Field and Factory Experiments :—			*Less* Expenditure	4,833 70	140 41 2,564 99
Field Experiments	5,618 95				
Factory Experiments	3,867 72	9,486 87	,, Balance being Excess of Expenditure over Income for the Year		10,118 09
,, Office :—					
Stationery and Office Equipment	3,289 94				
Postages and Telegrams	1,860 93				
Advertising	1,952 72				
Telephones	995 00				
Audit	850 00	8,948 59			
,, Travelling :—					
Expenses of Board Members	3,508 70				
Expenses of Staff	5,076 30	8,585 00			
		173,630 49			
,, Maintenance of Buildings, Power and Water Supply :—					
Laboratories and Offices	414 47				
Bungalows	6,879 89				
Power and Water Supply	4,982 04				
Bungalow Furniture Replacements	267 46	12,543 86			
,, Miscellaneous Items Shared with Estates :—					
Dartonfield General Charges	23,069 34				
Nivitigalakele General Charges...	12,369 06				
Hedigalla General Charges	7,947 80				
Upkeep of Roads and Grounds...	1,056 80				
Factory Upkeep	1,330 36				
Power Supply	5,541 92	51,315 28			
,, Contingencies :—					
Contribution to London Advisory Committee ...	21,704 34				
General Charges	1,476 01				
Insurances	3,800 61				
Staff Provident Fund	18,073 16				
Passages	6,000 00				
Entertainment Allowance	95 00				
War Allowance to Staff	38,093 98				
Contribution to Medical Fund	1,658 00	90,901 10			
,, Depreciation		18,438 47			
	Rs.	346,829 20		Rs.	346,829 20

CAPITAL ACCOUNT AS AT 31st DECEMBER, 1946.

EXPENDITURE	To December 31st, 1945	Transfers between Accounts	Additions in 1946	Total	RECEIPTS	Rs. C.	Rs. C.
	Rs. C.	Rs. C.	Rs. C.	Rs. C.			
To Land Including Development :—					By Revenue Applied for Capital Purposes at December 31st, 1945	865,586 29	
Dartonfield					*Less* Value of one Underwood typewriter sold	200 00	865,386 29
Nivitigalakele ...	58,602 32		8,634 46	147,236 78			
Hedigalla	29,916 84		41,254 53	71,171 37	In 1946		136,700 92
,, Buildings and Lines :—							
Dartonfield—							
Estate	54,192 03		14,131 84	68,323 87			
Headquarters ...	197,708 51		37,049 54	234,758 05			
Nivitigalakele—							
Estate	22,661 51		9,358 93	32,020 44			
Headquarters ...	21,993 03		—	21,993 03			
Hedigalla—							
Estate ...	14,476 51		4,806 86	19,283 37			
Headquarters ...	—		—	—			
,, Furniture and Fixed Equipment :—		Cr.					
Dartonfield	42,088 53	200 00	6,377 53	48,266 06			
Nivitigalakele ...	5,164 90		568 80	5,733 70			
Hedigalla	555 88		—	555 88			
,, Power and Water Supply :—							
Dartonfield	44,806 31		4,250 77	49,057 08			
Nivitigalakele ...	6,128 09		—	6,128 09			
Hedigalla	174 50		—	174 50			
,, Machinery and Tools :—							
Dartonfield	109,198 70		—	109,198 70			
Nivitigalakele ...	3,783 22		—	3,783 22			
,, Laboratory Apparatus	34,662 54		9,703 74	44,366 28			
,, London Plant	11,333 34		—	11,333 34			
,, Live Stock	125 75		—	125 75			
	865,586 29	200 00	136,700 92	1,002,087 21			1,002,087 21

STATEMENT OF EXCESSES AND SAVINGS ON VOTES

Expenditure.

Head of Estimates.	*Account.*	*Estimate* Rs.	*Capital* Rs.	*Revenue* Rs.	*Excess* Rs.	*Saving* Rs.	
1.	ADMINISTRATION OF THE BOARD :—						
	Travelling Expenses of Members ...	3,000 00		3,508 70	508 70		More meetings held.
2. A-I.	EMOLUMENTS OF SENIOR SCIENTIFIC STAFF	104,525 00		71,248 36		33,275 64	Research Assistants not appointed, and non-employment of complete staff.
3. A-G.	EMOLUMENTS OF JUNIOR SCIENTIFIC STAFF	23,155 00		16,673 62		6,481 38	New appointments not made owing to above.
4.	LIBRARY AND PUBLICATIONS :—						
A.	Library	1,500 00		1,098 58		401 42	Economies.
B.	Publications	2,500 00		1,825 40		674 60	Fewer publications issued.
5.	SMALL-HOLDINGS WORK :—						
A-C.	Emoluments of Staff	25,802 00		22,524 22		3,277 78	Three new Instructors appointed late in the year.
D-E.	Travelling and General Expenses ...	15,474 00		9,386 61		6,087 39	Less travelling done.
6.	LABORATORY :—						
A.	Equipment and Working Expenses ...	17,363 00	9,760 54	6,550 10		1,052 36	Payments not completed.
B.	Furniture Replacements	50 00		31 85		18 15	
7.	FIELD AND FACTORY EXPERIMENTS :—						
A.	Field Experiments	10,215 00		5,618 95		4,596 05	Curtailment of experiments.
B.	Factory Experiments	6,471 00		3,867 72		2,603 28	Less experiments undertaken.
8.	OFFICE :—						
A-C.	Emoluments of Office Staff	17,090 00		17,270 49	180 49		Payment of acting allowances.
D.	Stationery and Office Equipment ...	4,500 00	656 00	3,289 94		554 06	Economies.
E.	Postages and Telegrams	2,500 00		1,860 93		639 07	Economies.
F.	Advertising	300 00		1,952 72	1,652 72		More vacancies advertised.
G.	Telephone	1,010 00		995 00		15 00	
H.	Audit	850 00		850 00			
9.	TRAVELLING EXPENSES OF STAFF... ...	9,000 00		5,076 30		3,923 70	Less travelling due to shortage of staff.
10.	MAINTENANCE OF BUILDINGS, WATER AND POWER SUPPLY :—						
A.	Laboratories and Offices	1,000 00		414 47		585 53	Less work undertaken.
B.	Bungalows	6,436 00		6,879 89	443 89		More repairs undertaken as approved by Experimental Committee.
C.	Water and Power Supply	1,500 00		4,982 04	3,482 04		Unexpected repairs to motors, and spare materials for electrical work.
D.	Bungalow Furniture Replacements ...	250 00		276 46	17 46		
11.	MISCELLANEOUS ITEMS SHARED WITH ESTATE :—						
A.	Dartonfield General Charges	21,278 00		23,069 34	1,791 34		Increased dearness allowance.
B.	Nivitigalakele General Charges	11,648 00		12,369 06	721 06		Increased dearness allowance.
C.	Hedigalla General Charges	8,080 00		7,947 80		132 20	Economies.
D.	Upkeep of Roads and Grounds	1,125 00		1,056 80		68 20	
E.	Factory Upkeep	1,075 00		1,330 36	255 36		Increased cost of machinery parts.
F.	Power Supply	6,887 00		5,541 92		1,345 08	Less power requirements.
12.	CONTINGENCIES :—						
A.	Contribution to London Advisory Committee	22,000 00		21,704 34		295 66	Difference in exchange.
B.	General Charges	1,000 00		1,476 01	476 01		Value of 563 lbs. crumb rubber destroyed.
C.	Insurance Charges	4,000 00		3,800 61		199 39	Over-estimation due to non-completion of building programme.
D.	Staff Provident Fund	21,400 00		18,073 16		3,326 84	Non-employment of complete staff.
E.	Passages	6,000 00		6,000 00			
F.	Entertainment Allowance	150 00		95 00		55 00	
G.	War Allowance to Staff	49,370 00		38,093 98		11,276 02	Non-employment of complete staff.
H.	Contribution to Medical Fund	1,950 00		1,658 00		292 00	Non-employment of complete staff.
13.	DEPRECIATION	20,200 00		18,438 47		1,761 53	Over-estimate.
14.	PLANTING FOOD CROPS—HEDIGALLA ...	2,800 00				2,800 00	Larger crop realised.
15.	CAPITAL ACCOUNT :—						
A.	Upkeep of Dartonfield Immature Areas	421 00	492 60		71 60		
B.	Upkeep of Nivitigalakele Immature Areas	2,771 00	2,470 68			300 32	Less incidence of disease.
C.	Replanting 21 Acres—Nivitigalakele ...	6,636 00	6,003 78			632 22	Economies and penalty recovered from contractor.
D.	Upkeep of Hedigalla Immature Areas ...	5,697 00	4,710 58			986 42	Less work undertaken owing to shortage of labour.
E.	Planting 16 Acres—Hedigalla New Clearing	6,472 00	4,735 75			1,736 25	Smaller area planted.
F.	One Senior Staff Bungalow (Dartonfield)	40,000 00				40,000 00	Work not undertaken.
G.	Bungalow for Secretary-Accountant ...	38,203 00	3,605 75			34,597 25	Work not completed.
H.	One Junior Staff Bungalow (Dartonfield)	12,000 00	84 32			11,915 68	Work not completed.
I.	1 Quadruple Labourers' Cottage (Dartonfield)	8,000 00				8,000 00	Work not undertaken.
J.	2 Double Sets Latrines for Lines (Dartonfield)	800 00	519 60			280 40	Alteration of design.
K.	Alterations to Laboratories ...	5,000 00	316 04			4,683 96	Entire work not undertaken owing to non-appointment of Research Assistants.
L.	Rice and Tool Store (Nivitigalakele) ...	5,263 00	5,124 96			138 04	Painting of roof not undertaken.
M.	Smoke-house (Nivitigalakele)	5,000 00	4,802 77			197 33	Fire-box not purchased.
N.	1 Quadruple Labourers' Cottage (Nivitigalakele)	8,000 00				8,000 00	Work not undertaken.
O.	1 Quadruple Labourers' Cottage (Hedigalla)	8,000 00				8,000 00	Do do
P.	Furniture and Fixed Labour Equipment ...	3,600 00				3,600 00	Equipment not purchased owing to non-appointment of Research Assistants.
Q.	School and Creche and Schoolmaster's Quarters	15,134 00	14,851 59			282 41	Work not completed.
R.	Quadruple Cottages for Peons (Dartonfield)	11,455 00	11,906 00		451 00		Door and window fittings, water supply and latrine not provided for.
S.	Chummery for Research Assistants ...	28,409 00	29,301 86		892 86		Door and window fittings and servants' latrine not provided for.
T.	Carpenter's Shed (Dartonfield) ...	118 00	109 63			8 37	
U.	Drying House for Crepe Samples (Dartonfield)	300 00	254 88			45 12	Over-estimate.
V.	Alterations in Experimental Factory ...	1,000 00	97 60			902 40	Extended chemical programme not undertaken.
W.	Hedigalla Cart Road	40,156 00	31,808 20			8,347 80	Payments not completed.
X.	Hedigalla K.P.'s Quarters	5,972 00	4,806 86			1,165 14	Work not completed.
Y.	Additional Servants' Latrine for J. S. Bungalows	100 00	49 61			50 39	Existing latrine renovated.
Z.	Volley Ball Court for Junior Staff ...	75 00	71 32			3 68	
	Survey of New Clearings (Nivitigalakele)	160 00	160 00				

ESTIMATES FOR 1947

(Adopted by the Board, November 11th, 1946).

Income.

		Rs.
1.	Cess Collections	224,000
2.	Interest	18,694
3.	Sale of Publications	800
4.	Profit from Dartonfield	1,737
5.	Profit from Nivitigalakele	5,553
6.	Sundry Receipts	2,500
		253,284

Revenue Expenditure.

		Rs.	Rs.
1.	ADMINISTRATION OF THE BOARD :—		
	Travelling Expenses of Members		3,250
2.	PERSONAL EMOLUMENTS :—		
	Senior Scientific Staff	139,070	
	Junior Scientific Staff	23,108	162,178
3.	LIBRARY AND PUBLICATIONS :—		
	Library	1,500	
	Publications	3,500	5,000
4.	SMALLHOLDINGS DEPARTMENT :—		
	Salaries and Allowances	27,550	
	Travelling and General Expenses	18,000	45,550
5.	LABORATORY :—		
	Equipment and Working Expenses ...	6,000	
	Furniture Replacements	50	6,050
6.	FIELD AND FACTORY EXPERIMENTS :—		
	Field Experiments	6,560	
	Factory Experiments	6,459	
	Budding Instruction	—	13,019
7.	OFFICE :—		
	Salaries of Office Staff	17,802	
	Stationery and Office Equipment	4,500	
	Postage and Telegrams	2,500	
	Advertising	300	
	Telephone	995	
	Audit	850	26,947
8.	TRAVELLING EXPENSES OF STAFF :		
	Officers' Expenses		9,000
9.	MAINTENANCE OF BUILDINGS, WATER AND POWER SUPPLY :—		
	Laboratories and Offices :	500	
	Bungalows	5,000	
	Water and Power Supply	2,500	
	Furniture Replacements	500	8,500

10. MISCELLANEOUS ITEMS SHARED WITH ESTATES :—			
Dartonfield General Charges		23,739	
Nivitigalakele General Charges		12,947	
Hedigalla General Charges		8,994	
Upkeep of Roads and Grounds		1,125	
Factory Upkeep		1,075	
Power Supply		7,266	55,146
11. CONTINGENCIES :—			
Contribution to London Advisory Committee		27,000	
General Charges		1,000	
Insurance Charges		5,000	
Staff Provident Fund		31,1400	
Passages		15,000	
Entertainment Allowance		150	
War Allowance to Staff		54,450	
Contribution to Medical Fund		2,150	135,890
12. DEPRECIATION			24,545
13. PLANTING FOOD CROPS—HEDIGALLA ...			1,000
			496,075

Capital Expenditure.

BUILDINGS :—	Rs.	Rs.
Dartonfield :		
3 Junior Staff Bungalows	33,000	
Quarters for Attendants	10,000	
2 Sets of Double Room Latrines for Lines ...	520	43,520
Hedigalla :		
1 Quadruple Labourers' Cottage	8,000	
Rice and Tool Store	4,000	
1 Set of Double Latrines	260	
1 Junior Staff Bungalow	11,000	23,260
EQUIPMENT :—		
Laboratory Equipment	3,000	
1 Steel Filing Cabinet for Head Office ...	300	
Replacement of 2 Old Head Office Typewriters	1,000	
New Storage Battery	12,500	
1 New 80/90 H.P. National Engine for Factory	50,000	
Replacement of Old Estate Office Typewriter ...	700	67,500
IMMATURE AREAS :—		
Dartonfield	3,958	
Nivitigalakele	2,890	
Hedigalla	14,071	20,919
		155,199

Summary.

	Rs.	Rs.
Income		253,284
Expenditure :—		
Revenue	496,075	
Capital	155,199	651,274
Excess of Expenditure over Income		397,990