A

GUIDE

TO THE

TEA RESEARCH INSTITUTE

OF

CEYLON

Compiled by

R. L. DE SILVA, BSc (Cey), PhD (Lond), DIC

THE TEA RESEARCH INSTITUTE OF CEYLON

TALAWAKELE, CEYLON

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LIST OF ILLUSTRATIONS

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(On 1st January, 1967)

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The Chairman, Low-Country Products Association of Ceylon :
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The Director, Tea Research Institute of Ceylon :
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Mr D. E. Hettiarachchi
Mr M. Rajendram, MBE

Appointed by the Honourable The Minister of Agriculture to represent the House of Representatives :
Mr D. J. Ranaweera, MP

Secretary : Mr A. C. Perera

PLATE 2—*The Tea Research Institute of Ceylon — Low-Country Station — St Joachim Estate*

THE STAFF

*(on 1st January, 1967 *)*

DIRECTORATE

DIRECTOR	... E. M. Chenery, BSc, PhD (Lond), ARCS, DIC
DEPUTY DIRECTOR	... J. A. H. Tolhurst, BSc (Reading)
ASSISTANT DIRECTOR	... L. H. Fernando, BSc, PhD (Lond)

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AGRICULTURAL CHEMISTRY

Agricultural Chemist	J. A. H. Tolhurst, BSc (Reading)
Research Assistants	W. M.W. B. Manipura, BSc (Cey)
	S. Sivasubramaniam, BSc (Cey)
Technical Assistants	V. Fernando
	S. G. Jayasuriya
	T. C. Z. Jayman
	T. Kularatna, BSc (Cey)
	C. C. Rajasingham
	A. Somaratne, BSc (Cey)
	S. Sunderalingam, BSc (Poona)

BIOCHEMISTRY

Biochemist	R. L.Wickremasinghe, BSc (Cey), BSc (Lond), PhD (Sheff), FRIC
Research Officer	A. S. L. Tirimanna, BSc, PhD (Lond)
Research Assistants	G. R. Roberts, BSc (Cey), ARIC
	R. R. Selvendran, BSc (Cey)
Technical Assistants	U. L. L. de Silva, BSc (Cey)
	B. P. M. Perera
	K. P.W. C. Perera, BSc (Cey)
	V. H. Perera, BSc (Cey)
	K. Sivapalan, BSc (Cey)

ENTOMOLOGY

Entomologist	W. Danthanarayana, BSc (Cey), PhD (Lond), DIC
Research Assistant	D. J. W. Ranaweera
Technical Assistants	E. F.W. Fernando, BSc (Cey)
	S. N. Fernando, BSc (Cey)
	A. Kathiravetpillai, BSc (Cey)
	C. Shanmugam

PLANT PATHOLOGY & NEMATOLOGY

Plant Pathologist	N. Shanmuganathan, BSc (Cey), PhD (Lond)
Research Officer (Plant Pathology) ...	R. L. de Silva, BSc (Cey), PhD (Lond), DIC
Research Officer (Nematology) ...	P. Sivapalan, BSc (Cey), PhD (Rutgers)
Technical Assistants	P. V. Arulpragasam, BSc (Madras)
	S. R. A. Fernando, BSc (Cey)
	A. R. M. Hassim
	H. B. Herat, BAgSc (Massey, NZ)
	P. A. John
	T. Manivasagar
	S. Murugiah
	W. R. F. Rodrigo, BSc (Cey)
	S. Samarajeewa
	T. V. Saravanapavan, BSc (Cey)

PLANT PHYSIOLOGY

Plant Physiologist	U. Pethiyagoda, BSc (Cey), PhD (Lond), DIC
Research Assistants	S. Kandiah, BSc (Cey)
	S. Nagarajah, BSc (Cey), MS (Calif)
Technical Assistants	S. Krishnapillai, BSc (Cey)
	G. M. H. B.Wijethunga
	S.Wimaladharma

PLANT PROPAGATION

Adviser	A. V. Richards, BSc (Lond), MSc (Calif), Dip Agric (Cantab), AICTA (Trinidad)
Research Officer	V. S. Kulasegaram, BSc (Cey), PhD (Lond)
Research Assistant	A. R. Sebastiampillai, BSc (Cey)
Technical Assistants	A. S. B. Gomez, BSc (Cey)
	D. Janakiram, BSc (Madras)
	A. Nanayakkara, BSc (Cey)
	H. R. Solomon

STATISTICS

Statistician	P. Kanapathipillai, BSc (Lond), FSS
Technical Assistant	K. Seevaratnam

TECHNOLOGY

Technologist	D. Kirtisinghe, BSc (Cey), PhD (Lond), DIC
Tea Taster	C. H. Wickremesinghe
Research Assistants	W. C. A. de Silva, BSc (Cey)
	W. Joseph, BSc (Cey)
Technical Assistants	W. A. C. de Silva
	C. Kandappah, BSc (Cey)
	S. Samarasingham
	A. Thevathasan, BSc (Cey)

OUTSTATION SERVICES

LOW-COUNTRY SERVICE

Assistant Director	L. H. Fernando, BSc, PhD (Lond)
The Low-Country Station, Ratnapura	
Research Officer	D. T. Wettasinghe, BSc (Cey), PhD (Reading)
District Advisory Officer	J. V. Sabanayagam, BSA (Toronto)
Technical Assistants	E. J. B. de Silva, BSc (Cey)
	A. A. C. Karunaratne, BSc (Cey)
	D. D. Kroon
	N. S. Rajendram, BSc (Madras)
	T. F. Saldin, BSc (Cey)
	H. H. Samarakoon
	U. P. de S. Waidyanatha, BSc (Cey)
	N. Yogaratnam, BSc (Alahabad)
Chief Clerk	R. I. Pereira
Stenographer	S. K. P. Tambimuttu
Accounts Clerk	K. D. B. H. Abeygunawardena
Electrician	B. T. Ranasinghe
Works Clerk	T. D. V. Cooray
The Kottawa Substation, Talgampola	
Officer in Charge	K. H. G. Gunapala
Technical Assistant	H. D. Jayasinghe
Deniyaya	
Technical Assistant	J. I. H. Bandaranayake

MID-COUNTRY SERVICE

Mid-Country Scientific Officer ...	D. Calnaido, BSc (Cey), PhD (Lond)
District Advisory Officer	M. K. Vythilingam
Technical Assistants	T. A. Munasinghe
	H. B. Ratnayake
	K. Thirugnanasuntheran, BSc (Cey)

UVA SERVICE

Uva Scientific Officer	L. M. de W. Tillekeratne, BSc (Cey), MEd (Calif)
Technical Assistants	A. M. Abeysinghe
	N. L. C. Fernando, BSc (Cey)
	D. N. R. Wijewardena
Clerk	A. C. Perera

ADVISORY SERVICE

Chief Advisory Officer	C. B. Foster-Barham, MA (Cantab)
Research Assistants	R. K. Nathaniel, BSc (Poona)
	S. Sandanam, BSc (Cey)
District Advisory Officers	
Low Country	J. V. Sabanayagam, BSA (Toronto)
Mid Country	M. K. Vythilingam
Technical Assistant	M. Sikurajapathy, BSc (Cey)
Photographer	D. J. M. Hettiarachchi
Filing Clerk	K. L. de Alwis

LIBRARY AND PUBLICATIONS

Editors of Publications	E. M. Chenery, BSc, PhD (Lond), ARCS, DIC
	R. L. de Silva, BSc (Cey), PhD (Lond), DIC
Librarian	D. J. S. de Silva, BSc (Punjab)

ESTATES

ST COOMBS

Agriculturist	L. A. Seevaratnam, BSc (Dunelm)
Head Factory Officer	V. A. Fernandez
Apothecary	S. P. de Silva

ST JOACHIM

Superintendent	G. S. Muttettuwegama
Head Factory Officer	M. S. W. Wijeratne
Head Clerk	G. L. A. Thomas

ADMINISTRATION

Chief Administrative Officer	A. C. Perera
Secretary to the Director	G. A. S. Gunasinghe
Translator/Instructor	C. M. Fernando, BA (Cey)
Accounts Section	
Accountant	Vacant
Accounting Assistant	A. H. B. Dias
Assistant Secretary	C. Kirthiratne, FCCS
Accounts Clerks	H. Attanayake
	G. A. K. P. de Silva
	K. P. Gunawardena
	N. M. Jayatilleke
	S. Kulasabanathan
	M. B. Palies
	T. R. B. Sally
	W. J. Samuel
	N. Satchithananthan
	C. B. Warawita
	H. C. Wickremasinghe
Typing Section	
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	S. A. L. H. Fernando
	T. J. Hallaldeen
	B. P. Jones
	P. W. Uduwawala
	S. D. J. J. Vitharnepathirana
Clerk Typists	J. N. Apasingha
	D. W. Bartholomeusz
	C. V. R. D. Fonseka
	V. Kodagoda
	S. B. Wettewe
Postage Clerk	H. W. Perera
Engineering Section	
Electrical Foreman	W. R. Solomon
Clerk of Works	R. A. Daniel
Storekeeper	I. P. Dissanayake
Mechanics	D. A. S. Opatha
	K. S. Vadivelu
Electrician	K. A. Bowie
Clerk (Works)	K. H. T. Dassanayake

*When more than one officer is listed under a designation, the names appear in alphabetical order

SITUATION

The Administrative headquarters and main laboratories of the Institute are situated at St Coombs Estate, in the Dimbula District of the Central Province (Nuwara Eliya 9 miles ; Talawakele 6 miles ; Colombo 98 miles). St Coombs Estate is approached from the Colombo-Hatton-Nuwara Eliya Road (A7) by a branch road (1½ miles) from the 96th mile on the A7.

Railway Station : TALAWAKELE
Post Office : TALAWAKELE
Telegraphic Address : RESEARCH TALAWAKELE
Telephones :

Talawakele	44	Open at all hours; extensions to the Director's office, all Divisions and Senior Staff bungalows.
Tillicoultry	35	
Radella	36	Director's office during office hours only.
Radella	32	Chief Administrative Officer during office hours only.

Forwarding Agents : Messrs M. Y. Hemachandra & Co. (Transporters) Ltd., Talawakele, Maskeliya, Norwood & Colombo. Consignments sent by rail should be forwarded to the Railway Station, Talawakele, c/o The Forwarding Agents. *Carriage must be pre paid.*

Accommodation : There is a Guest House at St Coombs which is only open to persons visiting the TRI on business. Prior permission for accommodation must be obtained in writing from the Chief Administrative Officer, Tea Research Institute of Ceylon, Talawakele. Unless sufficient notice is given, accommodation cannot be guaranteed. A list of rules and charges is available on request. Good Hotel accommodation is available in Nuwara Eliya.

Visitors : Visitors are welcome on any day provided they make a prior appointment with the officer they wish to meet. Parties of visitors should make prior arrangements for their visits with the Chief Advisory Officer, Tea Research Institute of Ceylon, Talawakele.

THE TRI LOW-COUNTRY STATION

The TRI Low-Country Station is situated at St Joachim Estate in the Ratnapura District of the Sabaragamuwa Province (Ratnapura 6 miles, Colombo 65 miles). St Joachim Estate is approached from the Colombo-Avissawela-Ratnapura road (A8) by a branch road (2 miles) on the 60th mile.

Railway Station : RATNAPURA
Post Office : RATNAPURA
Telegraphic Address : RESEARCH RATNAPURA
Telephones :

Ratnapura	428	Extension to the Assistant Director's bungalow.
Ratnapura	359	Extension to the Superintendent's bungalow.

Forwarding Agents : A. R. M. Raman Chettiar & Co., No. 208, Sea Street, Colombo 11.
Accommodation : Rest House accommodation is available at Ratnapura.
Visitors : Visitors to the Low-Country Station are welcome on any day provided they make prior appointment with the Assistant Director, TRI Low-Country Station, Ratnapura, to whom all correspondence and enquiries should be addressed.

THE TRI UVA STATION

The TRI Uva Station is situated at Gonakelle Estate, in the Passara District of the Uva Province (Badulla 9 miles, Colombo 153 miles). The station is approached from the Badulla-Passara-Batticaloa Road (A5).

Railway Station:	BADULLA
Post Office :	DEBEDDE
Telegraphic Address :	RESEARCH DEBEDDE
Telephone :	Passara 546
Accommodation :	Rest House accommodation is available at Badulla.
Visitors :	Visitors to the TRI Uva Station are welcome on any day provided they make an appointment with the Uva Scientific Officer, TRI Uva Station, Debedde, to whom all correspondence and enquiries should be addressed.

THE TRI MID-COUNTRY STATION

The TRI Mid-Country Station is situated at Hantane Estate, (Kandy 3 miles) in the Kandy District of the Central Province. The Station is approached through Hantane Estate.

Railway Station:	KANDY
Post Office :	KANDY
Telegraphic Address :	RESEARCH KANDY
Telephone :	Kandy 7169
Accommodation :	Good Hotel accommodation is available at Kandy
Visitors :	Visitors to the TRI Mid-Country Station are welcome on any day provided they make a prior appointment with the Mid-Country Scientific Officer, TRI Mid-Country Station, Hantane, Kandy to whom all correspondence and enquiries should be addressed.

THE TRI KOTTAWA SUBSTATION

The TRI Substation is situated at Talgampola in the Galle District of the Southern Province (Galle 10 miles) and is approached on the 10th mile on the Galle-Udugama Road.

Railway Station:	GALLE
Post Office :	TALGAMPOLA
Accommodation :	Good Hotel accommodation is available at Galle.
Visitors :	Visitors to the Substation are welcome on any day provided they make a prior appointment with the Officer-in-Charge, TRI Sub-station, Talgampola, Galle District.

HISTORY

On the 8th of October 1925, an Ordinance was passed in the State Council of Ceylon, whereby provision was made for the establishment of a Tea Research Institute, and for the incorporation of its Board of Management. In accordance with the provisions of this Ordinance, the TRI was founded, and was to be maintained by funds derived from a cess of 0.1 cent on every pound of tea exported from Ceylon. An extract from Article 2 of the Ordinance reads as follows : " An Institute styled The Tea Research Institute of Ceylon shall be established in Ceylon for the purpose of research into and investigation of all problems and matters relating to the same ". The formal assent to the Bill of HE the Officer Administering the Government was given on 27th of October, 1925. The venture was fully endorsed both by the Planters' Association of Ceylon and the Ceylon Association in London.

The first meeting of the Board of the Tea Research Institute of Ceylon was held on the 7th of January 1926. Mr T. Petch, BA, BSc, a former Director of Agriculture, was appointed the first Director of the Tea Research Institute, and took office on the 8th of March at the Victoria Commemoration Buildings in Kandy, where the offices of the Planters' Association of Ceylon were accommodated. The senior staff consisted of Dr C. H. Gadd, DSc (Mycologist), Mr S. Stuart Light, ARCS, DIC (Entomologist) and Dr D. I. Evans, BSc, PhD (Biochemist).

Col. T. G. Jayawardene kindly made available his house ' Lindfield ' at Nuwara Eliya as a temporary laboratory, on a two-year lease with the option of yearly renewal. Through the kindness of the owners, Scrubs Estate in Nuwara Eliya, was the site of the Institute's earliest field experiments. From 1927 until 1929 the Entomologist and his assistants were stationed at Mahagalla Estate Maskeliya and worked exclusively on control measures against the Tortrix Caterpillar (*Homona coffearia*) which was then the major insect pest of tea in Ceylon. A search for a suitable estate for the TRI experimental station was begun in 1927.

In December 1928, the Board purchased St Coombs Estate for Rs. 600,000 from the Anglo-Ceylon and General Estates Co. Ltd. The average yield of the estate was about 480 lb made tea per acre. The Board obtained a loan of Rs 1,000,000/- from the Government of Ceylon at 6% interest, to be repaid in 25 annual instalments for the purchase of the estate and the development of the Experimental Station. The repayment of the first instalment was made in 1929, and the last in 1953.

Volume I of *The Tea Quarterly*, the scientific journal of the TRI, was published in 1928. The aims of the journal were described by the Editor (Mr T. Petch) as follows : " *The Tea Quarterly* will aim at providing a summary of all the available information relating to the cultivation and manufacture of tea, and will thus endeavour to fill a gap which at present exists in the agricultural literature of the British Empire."

In 1929, the Institute held its first conference in Peradeniya. The building of St Coombs factory was begun in March and completed in October in record time.

Mr T. Petch resigned his post as Director in 1929, and was succeeded by Dr R. V. Norris, DSc, former Professor of Biochemistry at the Indian Institute of Science, Bangalore.

A survey of St Coombs Estate was carried out in the same year. It revealed that the estate was 423 A. 2R. 12 P. in extent, made up as follows :

PLATE 3—*The Tea Research Institute of Ceylon — St Coombs Estate*

PLATE 4—*No. 1 Field at St Coombs, where experiments on shade trees are conducted*

	A	R	P
Tea in bearing	165	0	16
New clearings	74	1	34
Patna and swamp ...	184	0	02
Total ...	423	2	12

The laboratories at St Coombs were completed by the end of 1930. The laboratory at Nuwara Eliya and the temporary Entomology Unit for work on the Tortrix Caterpillar at Mahagalla Estate, Maskeliya were closed. All sections of the Institute were now concentrated at St Coombs. Work on tortrix control was also centered at St Coombs. One Junior and four Senior Staff bungalows were built. The new laboratories of the TRI were opened in 1931 by HE the Officer Administering the Government (Sir Bernard Bourdillon, KBE, CMG) who also initiated the proceedings of the 2nd Conference of the TRI. The Institute was exempted from the Income Tax Ordinance, which came into operation during 1932.

In 1933, at the Institute's 3rd Conference held for the first time at St Coombs, the Director of the Institute (Dr R. V. Norris) stated that his staff comprised seven senior officers and fifteen assistants, five of the latter being stationed outside St Coombs.

A Tea Technologist (Mr J. Lamb) was appointed to the staff, and assumed duties in February 1934.

The fourth Conference of the Institute was held at St Coombs in 1937. In the same year, the Board's intention to set up a substation at Passara materialized. A property was leased from the Nayabedde Estates Co. Ltd., at Gonakelle Estate. A small laboratory and bungalow were built on the new substation. The internal parasite (*Macrocentrus homonae*) of the Tortrix Caterpilar (*Homona coffearia*) was introduced to Ceylon from Java, with a view to controlling Tortrix biologically.

In 1937, the Board decided to centralize the administration of the Institute at St Coombs, under the Director, instead of duplicating administrative work at both Kandy and St Coombs. The Director was placed in full charge of the activity and property of the Institute, and was to be responsible to the Board. The Director was placed in charge of St Coombs Estate and the Superintendent who was earlier responsible to the Board, was to be now made responsible to the Director. A long declared policy of the Board that the estate should be regarded as an integral part of the research organization was thus fulfilled.

The Institute's 6th Conference was held at the Radella Club in 1939. During the same year, the meadow eelworm was discovered on the roots of mature tea, where it was found to be doing considerable damage. The Institute also made the discovery that phloem necrosis is caused by a virus. This disease became the first known virus disease of tea in Ceylon. A Guest House for official visitors was opened at St Coombs in 1939.

In 1940, success was achieved in controlling the Tortrix Caterpillar (*Homona coffearia*) biologically using its parasitic *Macrocentrus homonae*. It remains one of the outstanding achievements of the Institute. The Plant Protection Ordinance relating to the restriction of transport of tea plants because of the risk of spreading Tortrix was justifiably amended.

After intensive research, the Institute published detailed accounts of the life-history of, and host specialization in the Shot-hole Borer of tea (*Xyleborous fornicatus*) in 1941. The senior staff was severely depleted because many officers were overseas on military service during the war years. The Institute advised estates on how to adjust their fertilizer programme to conform with fertilizer availability, following fertilizer rationing during the war years.

At the end of October 1946 Blister Blight Leaf Disease caused by the fungus *Exobasidium vexans* first made its appearance in Ceylon on an estate in the Dolosbage district. It was observed at St Coombs in the first week of December and had spread to all planting districts by the end of the year.

In 1947, the TRI held its 7th Conference at the Radella Club. Many papers on Blister Blight were presented at the Conference. The discovery was made that there was marked differential clonal susceptibility to the disease. Fertilizer rationing was continued, due to a world shortage of nitrogen. The fertilizer situation was aggravated by the dislocation of the transport services caused by the unprecedented floods in August. Recommendations for *Poria* control by the removal of infected roots were given to estates in 1947.

Intensive work on Blister Blight was carried out during 1948. The entire staff was preoccupied with the work on the disease.

Two conferences were held during 1949 in connexion with Blister Blight. In the same year, the TRI Monograph No 1 " The work of the Agricultural Chemistry Division " was published. Two senior research workers (Dr C. H. Gadd, Plant Pathologist and Dr T. Eden, Agricultural Chemist) left the service of the Institute.

A special vote of Rs 150,000/- was sanctioned by the Government of Ceylon for the intensification of the Blister Blight campaign in 1950. The TRI Monograph No 2 " The commoner diseases of tea " was published in the same year.

At the 9th Conference of the Tea Research Institute held at Nuwara Eliya, the life history of *Exobasidium vexans* was described in full, and a report on the work in progress was outlined. Several crop protection courses and demonstrations were held in many districts. The successful control of Blister Blight remains a monumental achievement in the history of the Institute, and is a classical example of the benefits accruing to an industry through research.

In 1951, an additional cess of 0.05 cent per lb of made tea exported was granted to the Institute for extending the small-holdings advisory service.

The clonal tea on No 10 field at St Coombs, from which most estates in Ceylon have subsequently obtained VP cuttings, was brought into bearing, and, in the same year, for the first time in the history of St Coombs Estate, the yield topped the 1.000 lb per acre mark, and attained a record of 1014 lb made tea per acre.

Symptoms of potash deficiency in tea were defined and illustrated. *The Tea Quarterly* completed its 25th year of publication and the Planters' Association of Ceylon celebrated its centenary in 1953. In 1954 after much agitation the TRI cess was increased from 0.5 cent to 0.55 cent per lb of made tea exported from the country. The TRI Monograph No 3 " The organization of tea research work in Ceylon" was published in the same year.

Twenty five acres of patana land were obtained by the Institute on long lease by arrangement with the Nayabedde Estates Company Ltd. from Gonakelle Group at Debedde in 1955 for enlarging the clonal testing station there. In the same year twenty five acres of old rubber land were obtained from the Neuchatel Estates Ltd. for clonal testing under low-country conditions. In the same year the 11th Conference of the TRI was held at Nuwara Eliya.

In 1956 the Institute held a well attended Symposium at Ratnapura on the Shot-hole Borer. The services of a full-time Entomologist (Dr E. Judenko) were obtained for working exclusively of the Shot-hole Borer. The TRI Monograph No 4, "Tea manufacture in Ceylon" was published and was very well received by the Industry.

In the period 1956-1957, the Institute lost many of its senior research workers in quick succession and work was severely curtailed as a result. The standardization of the miniature manufacturing technique for black tea using small quantities of leaf was perfected about this time.

In 1958, the Government of Ceylon launched its scheme for the Rehabilitation and Replanting of uneconomic tea. The Institute held a seminar in Colombo on all aspects of replanting tea, to inaugurate the scheme.

The outstanding achievement of the Institute in the year 1959 was the development of a soluble instant tea which was superior to all other soluble teas then available on the market. The product was pioneered by the TRI and developed jointly by the TRI and the CISIR.

The Board's policy of sending Ceylonese Officers for training in research to foreign Universities or Research Institutes was implemented with the departure of the first two officers to the UK for training. In the same year the Institute's Scientific Advisory Committee in the UK was established.

The TRI Monograph No 4 "Tea Manufacture in Ceylon" was revised and published. An Advisory Division was established, and centred at St Coombs to provide an efficient liasion between the Institute and the Industry, and also to relieve research workers of the pressure of routine advisory work.

In 1960, the clonal testing unit at Neuchatel Group, Kalutara was closed, having served its purpose. In the same year the Hantane Substation was established primarily for purposes of clonal testing.

The 12th Conference of the TRI was held in Colombo in 1961.

After 25 years of agitation by the tea planters of the low-country, their aim of establishing a research station to deal with problems of tea growing in the low country was realized. Kahahengama Division of Palmgarden Group, Ratnapura was purchased in 1961 by the Institute, for the purpose of establishing a Low-Country Research Station, to deal with the special problems confronting low-country tea. The property was 416 acres in extent, of which 300 acres were in seedling tea. It was managed for the Institute by the Saffragam Tea and Rubber Company Ltd., through their agents George Steuart & Co. Ltd. until the Institute was in a position to take over the property two years later. The estate was renamed St Joachim in appreciation of the work of Dr A.W. R. Joachim in helping to establish it.

The Government of Ceylon decided to make certain concessions to assist the establishment of an Instant Tea Industry in Ceylon, with the object of opening new markets for tea. A German firm, Haelssen & Lyon of Hamburg were allowed to exploit these concessions commercially. In conjunction with Bosanquet & Skrine Ltd., they registered Ceytea Ltd. in Colombo. The process for obtaining powder tea direct from green leaf, which was poineered by the TRI thereby passed out from the Institute's hands.

The Institute decided to increase the scope of its research activities by entering new fields of study. Plant Breeding was envisaged as a long term project which could yield profitable results, and an officer was recruited to begin research on the subject. A full-time Statistician was appointed to the Institute's staff in order to strengthen further, the validity of the Institute's experimental findings by the more intensive use of the fundamental discipline of mathematics.

An officer-in-charge went into residence on the Kottawa Substation at Talgampola in the Galle District, where work on clonal testing and the distribution of cuttings to estates in the Southern Province was intensified.

The Government of Ceylon increased the Tea Research Institute cess from 0.55 cent to 1.0 cent per lb of tea exported from the Country.

In 1963, St Joachim Estate came under the direct control of the Tea Research Institute, and the building programme was initiated. The Kottawa Substation was enlarged by 30 acres. A scientific officer was stationed at Ratnapura to direct the activities of the station.

An advisory service was established to cater to the needs of the estates in the Uva Province. A full-time advisory officer was stationed at the Passara Substation, where this service was centered.

In 1963 it was reported that about 6000 acres of VP tea had been planted in Ceylon, of which, TRI clones covered more than 60% of the acreage.

In 1964 most of the Low-Country Station buildings at St Joachim were completed and the staff moved into residence. Research activities in the low country were supervised from the station. An advisory service was established and served the interests of the tea estates in the Western, Southern and Sabaragamuwa Provinces.

The Board decided to initiate research into the development of new machinery for tea manufacture, with the appointment to the staff of a mechanical engineer. It also decided to intensify biochemical research with special reference to the changes occurring in tea leaves during manufacture. The Board decided to engage the full time services of a tea taster to enlarge the scope of activity of the Technology Division. The TRI Monograph No 5 " A one day course in tea manufacture " was published.

The Board decided to enlarge the TRI Substations at Kandy and Debedde, so that the problems confronting estates in the mid country and in the Uva Province would receive more detailed attention.

In 1965, a major policy decision was made by the Board, to fully integrate St Coombs and St Joachim estates with the Institute. With this decision, the essential objective of the Institute as a research organization would be perpetuated, and the profit motive would be subordinated to that of acquisition of new knowledge.

With due ceremony, the new experimental factory at St Joachim commenced manufacture of estate leaf on the Ist January 1965. Supervision of manufacture at St Coombs factory was taken over by the Technology Division, and supervision of operations in central nursery at St Coombs was taken over by the Division of Plant Propagation. The Institute also launched its programme of extension experiments in co-operation with selected estates in all tea growing districts of the country in the same year.

In 1965 yields of 8000 lb per acre of made tea were recorded in Ceylon for the first time in the Industry's history, on a low-country estate growing clones TRI 2023 and TRI 2026. Ceylon became the world's biggest exporter of tea for the first time, and the Country exported more than half a billion pounds of made tea in the year.

The original process for obtaining a soluble instant tea which was developed by the TRI had passed out from its hands, and was handed over to commercial authorities who are proceeding with its exploitation. The Institute decided to initiate new research into the development of soluble tea, and decided to proceed with the project to its conclusion.

Towards the end of 1966 the soluble tea research programme was rewarded with success by the development of a process to produce an instant tea soluble in cold water. At the close of the 99th year of the existence of the Industry, the Institute looks back on more than four decades of progress where the Institute saved the industry from extinction on one occasion so far. St Coombs Estate pro duced an all-time record yield of 1663 lb made tea per acre in 1966.

ORGANIZATION

The Tea Research Institute of Ceylon was established in accordance with the provisions of the Tea Research Ordinance No 12 of 1925 as amended by the Tea Research Amendment acts of 1948, 1951, 1953, 1955, 1957, 1959 and 1961. The Tea Research Institute was set up for the purpose of research into, and investigation of all problems and matters relating to tea, and for the provision and publication of information relating to the same.

The Board is responsible for the affairs of the Institute, and its constitution is such that all sections of the Industry are represented. The Board consists of the following *ex-officio* members :

The Director of Agriculture
The Honourable The Minister of Finance
The Chairman, Planters' Association of Ceylon
The Chairman, Agency Section, Planters' Association of Ceylon
The Chairman, Low-Country Products Association of Ceylon
The Tea Controller
The Director, Tea Research Institute of Ceylon

In addition, the following bodies nominate representatives to the Board :

The Planters' Association of Ceylon (3 members)
The Agency Section, Planters' Association of Ceylon (3 members)
The Low-Country Products Association of Ceylon (3 members)
The Honourable The Minister of Agriculture to represent the tea small holders (2 members)
The Honourable The Minister of Agriculture to represent the House of Representatives (1 member)
Nominated members shall hold office for three years, but may be re-nominated from time to time.

The Board elects its own Chairman. The Secretary to the Board is *ex-officio*, the Chief Administrative Officer of the Tea Research Institute. The Board meets on a minimum of four occasions each year. The Board may, from time to time, appoint Committees (which may include persons who are not members of the Board) to consider, advise on, make suggestions and recommendations to, and report to the Board on various matters.

The Headquarters of the Board are situated at St Coombs, Talawakele. The Institute is financed by a cess of one cent levied on every pound of tea exported from the Country. The statement of the Institute's finances is required by statute to be audited by a member of the Institute of Chartered Accountants appointed by the Auditor General, and the certified statement is required to be presented to the Auditor General, whose report, together with the financial statement and the Annual Report of the Institute are placed before Parliament.

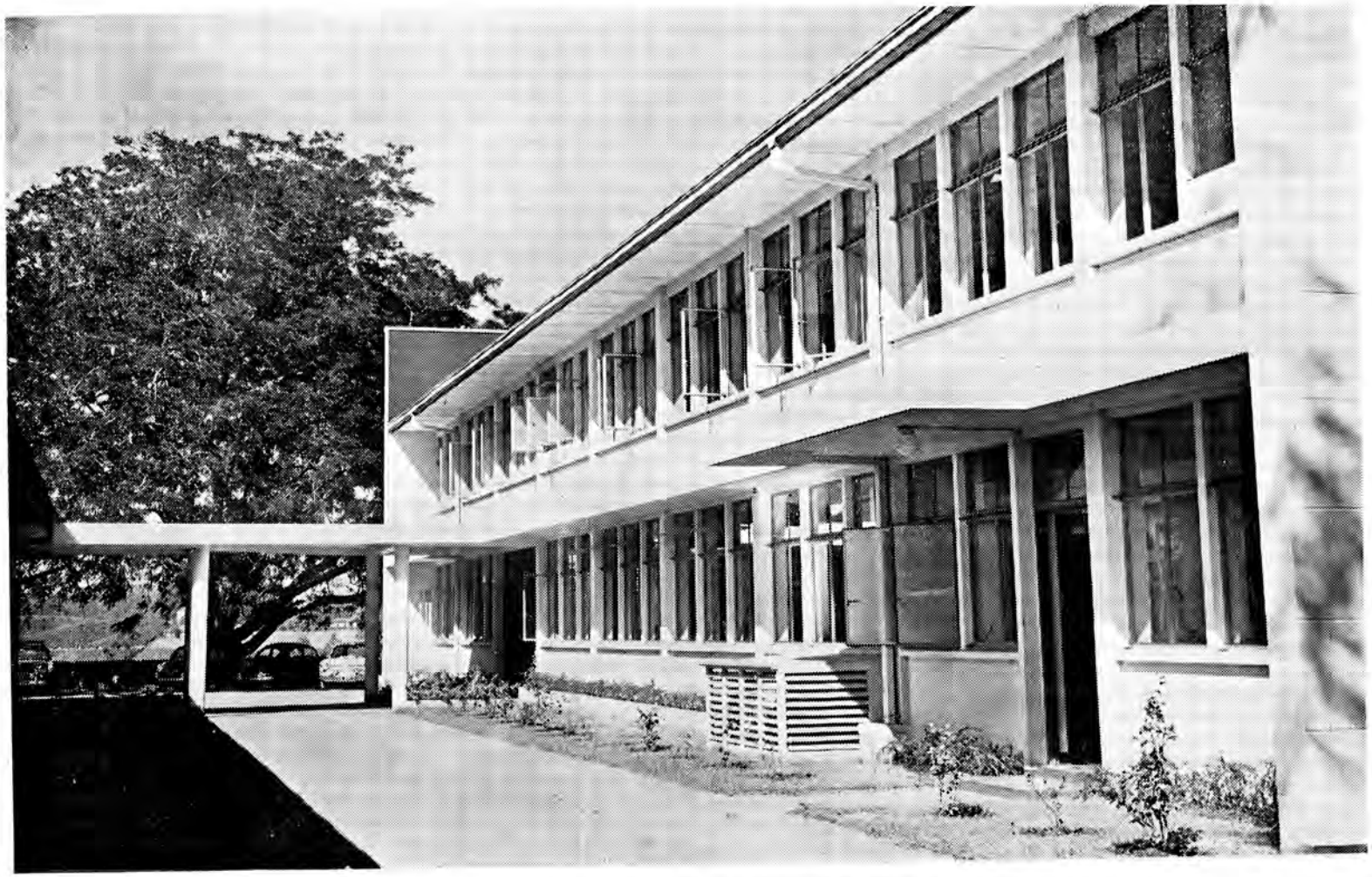

PLATE 5—*Administrative office and Biochemistry laboratory of the TRI at Talawakele*

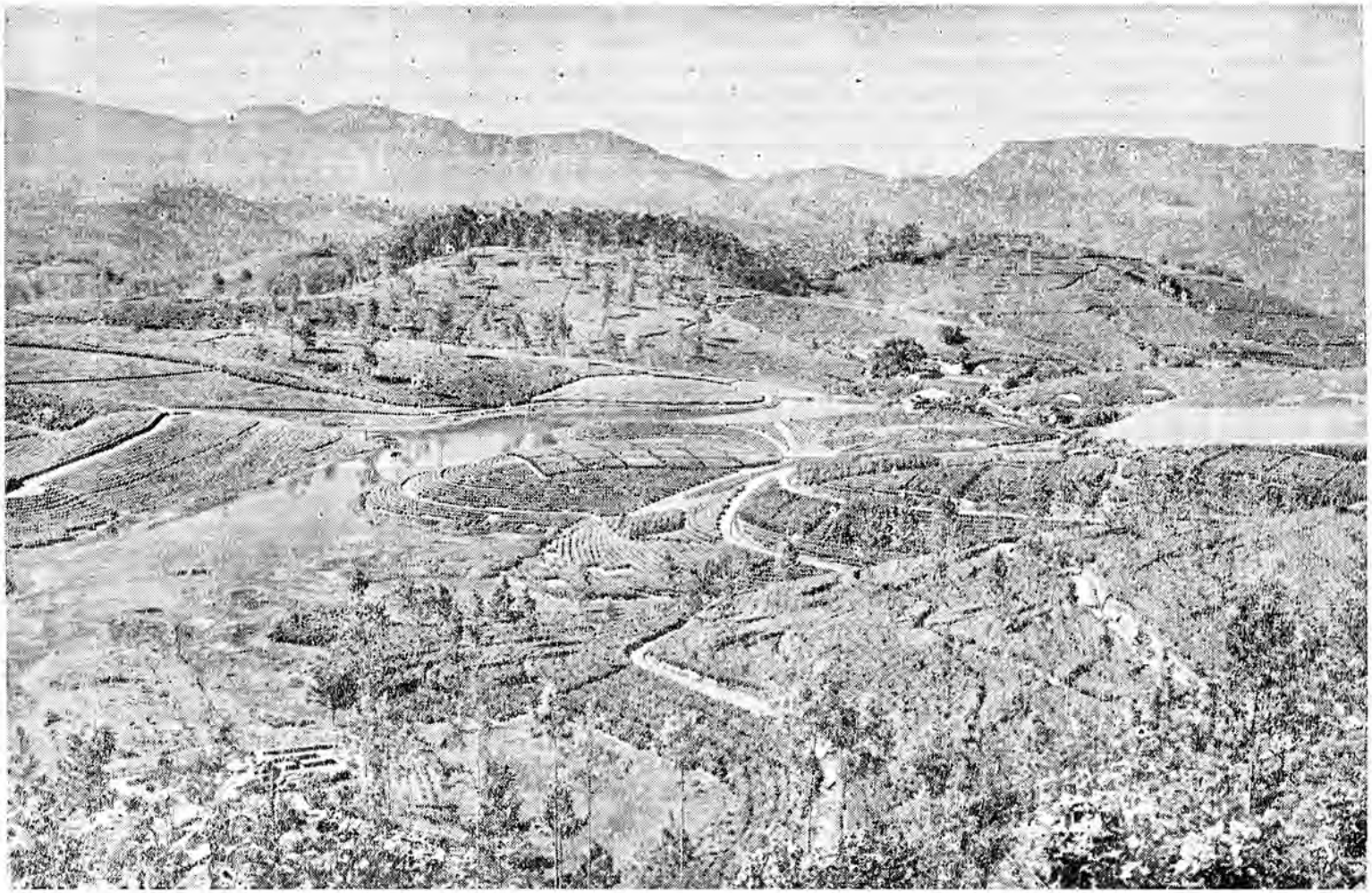

PLATE 6—*Field Nos 2 & 3 at St Coombs showing experimental areas*

RESEARCH

The main laboratories of the TRI are situated at St Coombs, Talawakele, and are well equipped for basic scientific research, as well as applied research in Agricultural Chemistry, Agronomy, Entomology, Nematology, Plant Biochemistry, Plant Breeding, Plant Pathology, Plant Physiology, Plant Propagation and the Technology and Biochemistry of the manufacture of tea. There is also a Statistics Division which collaborates with the other research divisions, particularly in field experimentation. Some account of the current activities of the various divisions are given on pp 24 to 52 in reports submitted by the divisional heads. There is a scientific library containing over 20,000 volumes, and receiving about 250 periodicals, and a fully equipped meteorological recording station.

The strength of the main categories of scientific staff now working at Talawakele are as follows :

Post-graduate research workers	..	..	14
Graduate research assistants	..	..	10
Graduate technical assistants	..	..	22
Non-graduate technical assistants	..	..	17

Some 220 acres of tea on St Coombs Estate (elevation 4500 ft) are available in their entirety for field experimentation. The up-to-date tea factory of St Coombs is managed by the Division of Technology, and is meant primarily for experimentation. The factory also manufactures surplus green leaf from the estate, which is not needed for immediate experimentation. These teas are sold at the Colombo auctions.

The Institute employs an Agriculturist to manage field work and labour on St Coombs Estate, and a Tea Taster to report on experimental samples of made tea.

AGRICULTURAL CHEMISTRY

One of the first of the Divisions to be set up, Agricultural Chemistry cover studies of fertilizer response, and the effect of fertilizer and various cultural operations on soil conditions. Advisory responsibilities are restricted only to more specialized problems.

At present the Division covers field experiment management together with more detailed chemical research into nutrient uptake by the tea bush and fertilizer reactions in the soil. Weed control problems have recently been added to the programme.

Following the changed economic climate in the post-1945 period, it was clear that intensity of cropping would need to be increased, and that fertilizer use would correspondingly increase. Pending the results of field experiments a provisional guide to fertilizer application was given to estates. Results of the recently initiated experiments are now enabling the Institute to refine earlier ideas on long-term fertilizer programmes.

Yield response to nitrogen has been consistently high at the higher elevations, and present rates of use of nitrogenous fertilizer are such that serious consideration has to be given to possible side effects on the soil. Nitrogen, the most expensive of our fertilizer nutrients, will no doubt continue to occupy the greater part of our research activities in order to ensure that maximum economic return is being achieved, with control of long-term reactions on other nutrients.

Phosphatic fertilizers were, for many years, popular with the tea industry, and recently experimental evidence has been obtained which suggests that economies could be made in present rates of application.

Potash deficiency was recognised in the 1950's as a serious field problem, especially at the higher elevations. Levels of application of potash, fortunately a cheap nutrient, were increased to cure the trouble. It is already clear from experiments that the probability of an economic yield response to potash will vary widely from one area to another, and the experimental programme has been expanded on a district basis to elucidate this point.

The use of magnesium for young tea clearings has been encouraged in recent years, together with prophylactic dressings for mature tea. Boron deficiency symptoms were diagnosed in certain species of shade trees a few years ago, in one of the main planting districts. Borate additions to the normal tea fertilizer mixtures effected a rapid large-scale cure.

The widespread appearance of zinc deficiency symptoms in tea, the first to be recorded in this crop, about five years ago remains to be explained. It is suspected that fertilizer imbalance is responsible, but this point has not yet been confirmed by experiment. The rapid recovery of affected bushes, and the high probability of appreciable yield response to zinc foliar sprays has been demonstrated in several experiments and in estate practice. The unusual tolerance of tea, in all stages of growth, to high concentrations of zinc sulphate solutions has allowed foliar spraying to be adopted widely as a simple, routine, estate operation. Experimental evidence showed that zinc oxide additions to the commoner copper fungicides offered yet another simple method for zinc applications.

The tea foliage is tolerant to high concentrations of solutions of many possible fertilizers, and attention has been directed to foliar-spraying operations for supplementary means of applying nutrients. Damage to the leaf from urea solutions has been found to be variable, at concentrations which might be required in practice. This point is receiving further study, in the light of possible changes in the source of supply of nitrogenous fertilizer to the tea industry.

Detailed investigations into the response of newly planted tea to fertilizer have recently been intensified. Evidence of high potential response has been obtained. Economic and physiological considerations allow and suggest that less usual types of fertilizer be studied, in order to permit safe and easy application of high doses of nutrients.

Problems of the effect of fertilizer levels on manufacturing properties of the flush are studied in conjunction with the Technology Division. To-date, careful investigation has failed to show any appreciable effects resulting from extreme experimental treatments, which had been in force over a period of more than 30 years. Joint research with the Plant Physiology Division, studies the relation between shade trees and response of tea to fertilizer.

In the last two years experimental investigations have been expanded into estates in the main tea planting districts. This should enable us to make more precise estimates of probable response to fertilizer, under a wide range of conditions.

BIOCHEMISTRY

The work in the Division is directed mainly towards the following objectives :

1 — Elucidation of the factors controlling the development of quality and flavour during tea manufacture,

2 — A study of the basis of colour and strength in tea liquors,

3 — Production of a ' soluble ' tea.

The development of quality and flavour during tea manufacture is dependent on the activity of enzymes systems which convert the ' raw material ' present in tea flush to the complex compounds which are responsible for quality and flavour in the finished product. The enzyme systems are being studied by various methods including starch gel electrophoresis, manometry and spectrophotometry, and evidence has been obtained for the presence in tea of polyphenolases, esterases, peptidases phosphatases and transaminases, as well as other enzyme systems which have not been characterized as yet. Tea flush is also being analysed for coenzymes, enzyme activators and enzyme inhibitors—in this connexion detailed studies are being made of coenzyme A, manganese and tannins in flush from several clones growing in different climatic conditions. Investigations of the metabolism of individual amino-acids have shown that leucine is converted during manufacture to steam-volatile compounds which could play an important part in the development of flavour. Radioactive tracers have been used in this investigation and some of the intermediate compounds in the pathway of this conversion have been separated and identified.

Studies on the colour and strength of tea liquors have shown that a complex consisting of protein, tannin and theanine is responsible for the major part of the colour and strength of liquors, previously attributed to an ill-defined group of compounds designated as ' thearubigins '.

Work is also being done on methods for preventing the formation of ' cream ' in tea liquors. In addition, cytological and immuno-chemical techniques are being used for the localization of the polyphenolase system in the tea leaf ; compounds capable of acting as anti-oxidants have been separated and identified, and studies made of their transformations during manufacture. The effect of different fertilizer treatments on soil microflora *etc*, and the comparative efficiency of utilization of ammonium salts and nitrates are also under investigation.

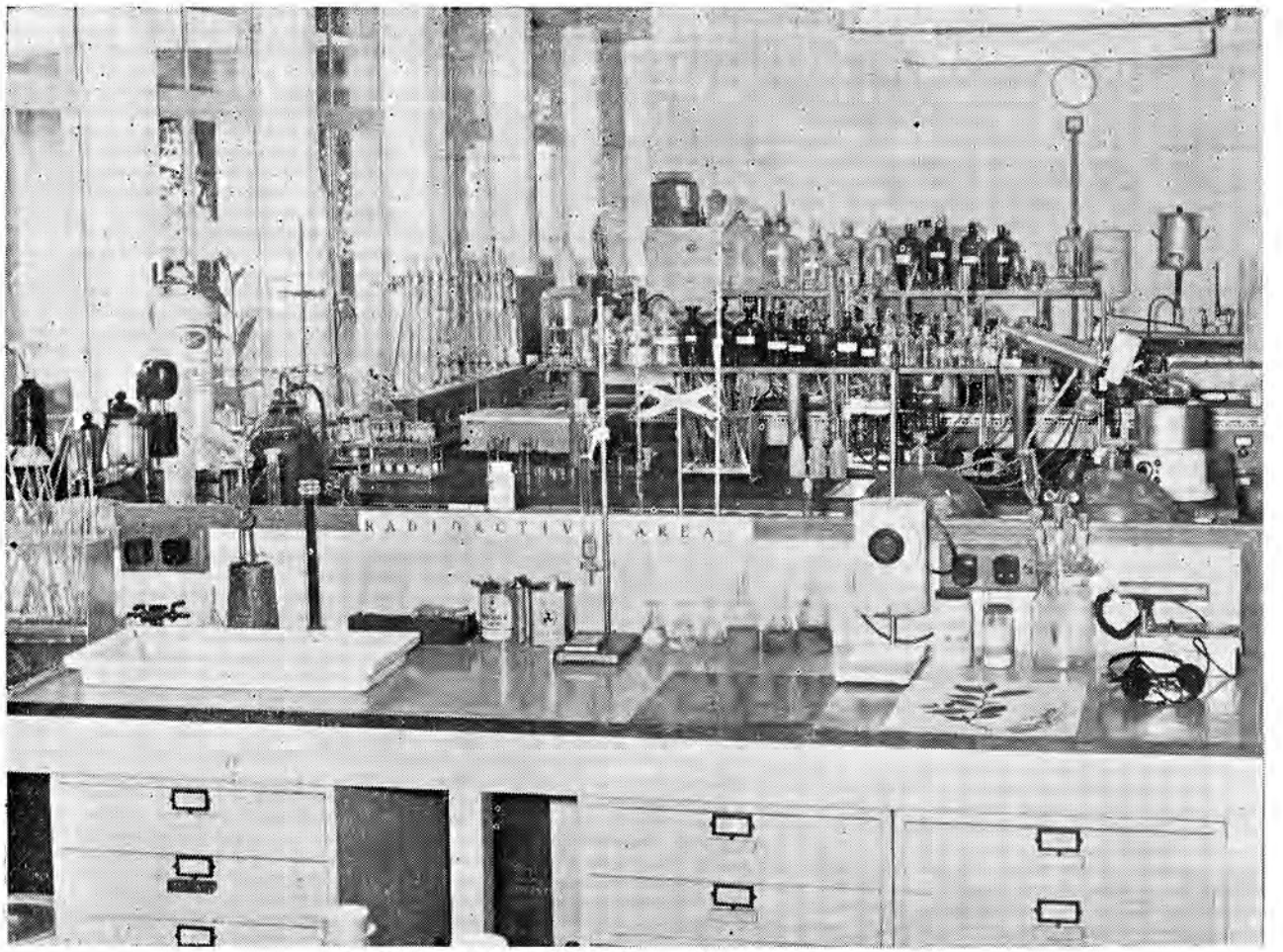

PLATE 7—*Radio-isotope laboratory of the TRI at Talawakele*

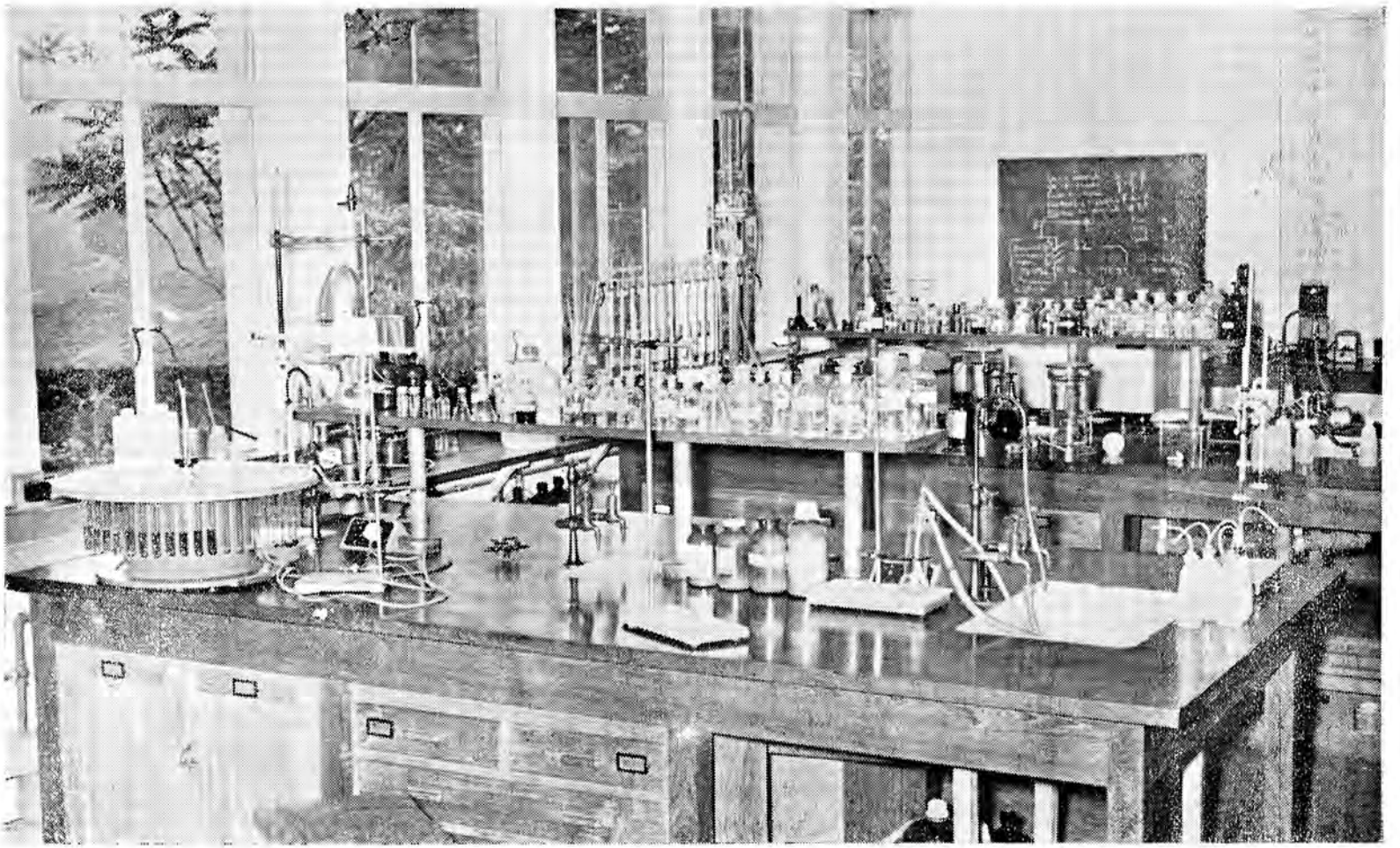

PLATE 8—*Biochemistry laboratory of the TRI at Talawakele*

ENTOMOLOGY

The division is primarily concerned with research leading to the control of insect and mite pests of tea. Although there is a wide range of pests on which research is carried out, much of the work is devoted towards the elimination of pests which are of serious economic importance, eg the Shot-hole Borer of tea, the Tea Tortrix and mites. Serious consideration is given to the control of new pests that may appear either due to natural causes or as a result of changes in agricultural practices.

The research programme includes studies on

(*a*) the biology and ecology of insect pests in order to obtain information on the life histories and behaviour, environment, effects of climate, host-pest relations, dynamics of pest populations in relation to the crop, loss of crop due to the pests and the ecological effects of pesticide applications. The information obtained is of use in locating the weak points in the life history of the pest and the ability of the pest to infest the crop. These factors can be exploited for the control of the pests.

(*b*) Methods of control embracing biological, chemical, cultural and other methods. Investigations are made on the possibilities of controlling insects and mites biologically using parasites, predators or pathogens.

The forces of nature, however, must be supplemented by the use of chemicals if the highest standards of protection are to be achieved and the necessity for chemical control, therefore arises. Chemicals are evaluated in well-designed experiments. Recommendations for their use are based on extensive field experimentation with plot experiments as well as with large scale trials. Tea being a food crop, the choice of pesticides is limited, and the ability of a chemical to kill a pest is not the only criterion which has to be taken into consideration before recommendations are made. In addition to their effectiveness, the chemicals are further tested for taints that might be imparted to the made tea and also to poisonous residues in the made tea. The pesticide residues should be below the legal levels acceptable to the consumer and the tea should be free from taint. These two factors are therefore given the foremost consideration.

The division is also engaged in the search for pest-resistant or tolerant tea clone, and in the development of cultural methods designed to minimize pest outbreaks and other possible methods of insect pest control. A collection of insect and mite pests associated with tea is maintained and service activities include identification of specimens and supervision of insect control work during severe outbreaks of certain pests.

PLANT PATHOLOGY & NEMATOLOGY

The Division is responsible for work on problems relating to all pathogens except insects and mites.

Plant Pathology

Two diseases of major economic importance to the tea industry in Ceylon are Blister Blight (*Exobasidium vexans*) and Red Root Disease (*Poria hypolateritia*). A third disease, Collar and Branch Canker, (*Phomopsis theae*) may be of potential importance to the industry through its effect on young clonal tea on certain estates. There are also some diseases or disorders like Phloem Necrosis Virus Disease and maintenance-leaf fall which are not clearly understood. Oil-spot Disease is confined mainly to seedling tea at elevations of about 6000 ft above sea level. Various root rots like Charcoal Stump Rot (*Ustulina deusta*), as well as Brown Root (*Fomes noxius*) and Black Root (*Rosellinia arcuta*) diseases are recorded occasionally, but rarely are more than a few bushes killed.

Although Blister Blight is effectively controlled by copper sprays, more money is spent on its control than on the control of any other disease or pest of tea. For refinements and economy in control, a full understanding of the epidemiology of the disease is required, and the various aspects being investigated include (*a*) measuring the number of spores of *E.vexans* in the atmosphere throughout the year ; (*b*) determining what meteorological and other factors are associated with changes in the number of spores; (*c*) studying the relationship between atmospheric spore numbers and deposition of spores on the leaves; (*d*) studying the factors that influence sporulation ; and, (*e*) attempting to forecast accurately disease incidence. Further, every year field trials are conducted to compare test fungicides with standard copper formulations in order to select more effective and cheaper fungicides. Work is also in progress to assess the extent of crop loss and the effect on quality of made tea caused by different levels of blister blight infection.

A significant advance in the control of *Poria* has been the recent discovery that methyl bromide is an excellent chemical for eradicating this disease. Current research is directed towards refinements in application techniques, testing of new fumigants, and studies on side-effects of soil fumigation, like its effect on soil microflora and fertility. A number of clones are also being examined for resistance to the disease. Other studies include investigations on inoculum potential and the behaviour and survival of the fungus in the soil. The usefulness of ring-barking shade trees in minimizing the outbreak of root diseases is being re-examined, and possible alternatives to ring-barking are also being sought.

Work on Collar and Branch Canker Disease concerns studies on factors predisposing young plants to infection, the origin of cankers, control measures, clonal susceptibility, and variation in pathogenicity between different isolates of *P. theae*.

A thorough study of Oilspot disease has been initiated recently. Aspects of the disease under investigation include (*a*) spread of the disease, (*b*) recovery of infected bushes by hard pruning ; and (*c*) identity of the causal fungus.

Work on Phloem necrosis which has been in abeyance for some years has now been resumed.

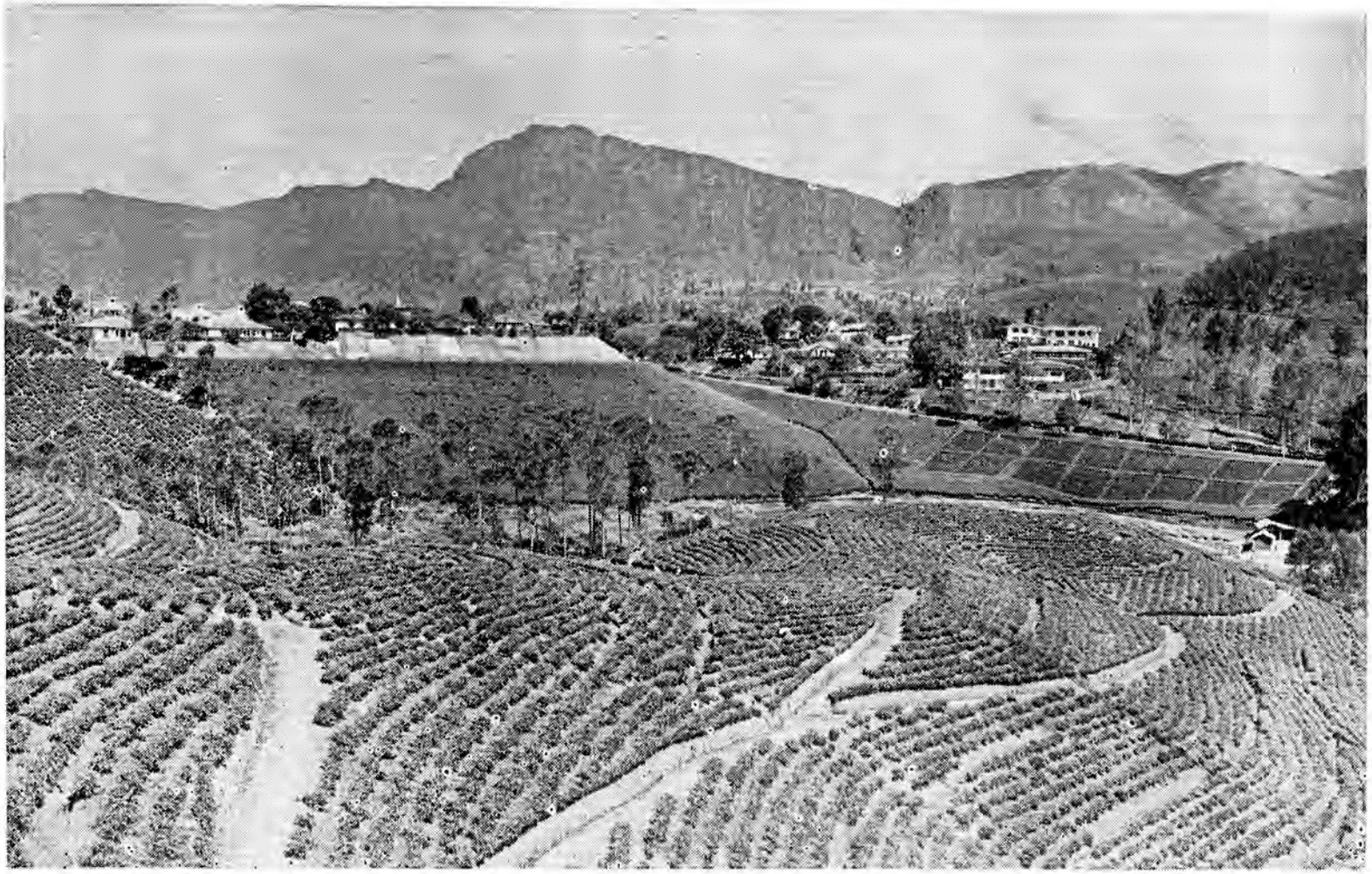

PLATE 9—*Field Nos 14 & 16 showing experimental areas, and staff bungalows at St Coombs*

PLATE 10—*Field Nos 13 & 14 at St Coombs, showing experimental areas*

Nematology

The most serious nematode disease and one of major economic importance to the tea industry, is caused by the root-lesion or meadow nematode, *Pratylenchus loosi*. A second nematode disease, caused by a species of root-knot nematode, *Meloidogyne brevicauda*, is not as yet of major economic importance on account of its very limited distribution, although, it may become so if it is allowed to spread unchecked. Another species of root-knot nematode, *M.arenaria*, is known to infest only young nursery plants. It fails to infest older plants because they acquire complete immunity with age, and is, therefore, not of economic importance to the industry. Several species of ectoparasitic nematodes have been associated with tea soils, some of which are recovered usually in large numbers and are being studied.

The selection of clones resistant to nematodes continues to be the most promising line of approach among the control programmes against the root lesion-nematode of tea. In order to curtail the time of screening for nematode resistance and tolerance, investigations are under way to obtain information about the chemistry and physiology of resistance among the different tea clones. Such information would permit the screening of hundreds of clones within a relatively short period. In order to control the root lesion nematode in established tea fields, several lines of approach are being investigated. Among these are (1) The economics of using nematocides in mature infested tea fields soon after pruning, with a possible view to developing a regular fumigation programme at every pruning cycle ; (2) the feasibility of using proper fertilizer mixtures to enhance the vigour of the infested tea and thereby counteract the damage caused by nematodes ; (3) The screening of systemic organophosphorous compounds in order to find a suitable nematocide that would eradicate populations of *P.loosi* within the roots of tea, and (4) to investigate further the benefits and the overall economics of rehabilitating infested fields with Guatemala Grass, both with respect to reconditioning the soil as well as controlling soil populations of parasitic nematodes, and comparing the benefits of rehabilitation with those from direct chemical fumigation.

Nematode infestation in tea nurseries is now satisfactorily controlled by proper and strict maintenance of nursery hygiene following research findings by this Division.

The Division also holds demonstrations on methods of disease control and assists the Advisory Division on routine identification of diseases and in the preparation of advisory literature.

PLANT PHYSIOLOGY

The Division concentrates on the study of the development and functioning of the tea bush both in the field and the laboratory, in ways which will clarify the fundamental principles underlying the production of this crop.

Studies on the growth of the tea plant range from investigations on the patterns of total dry matter production in the field and the manner in which conventional cultural practices affect these patterns, to the effects of various manipulative treatments on the growth of individual shoot components. Growth analysis techniques are applied to plants ranging from the nursery to adult stage.

New techniques are being evolved for raising tea plants in sand culture In pots as a prelude to studies on several physiological aspects of the nutrition of tea.

Cultural operations are studied with the aim of evaluating their effects in physiological terms. Plucking at difficult frequencies and at different degrees of severity is studied to assess the stimulus imparted to enhanced production of new pluckable shoots. The influences of leaves of different age on the growth of new shoots based on their nutritional and hormonal balances are studied by the analysis of leaf extracts and the incorporation of radioactive carbon from $C^{14}O_2$ as well as by other methods. Such studies would lead to a better understanding of the roles of ' lungs ' retained at pruning and of ' maintenance foliage '. The recovery of bushes from pruning is studied in such ways as to evaluate the importance of nutritional substrates—both inorganic and organic—in ensuring speedy and complete recovery while minimizing the occurrence of dieback and casualties resulting from the operation. The analysis of root samples for changes in carbohydrate levels and of young sprouts on the frame for their nutrient contents, comprise part of this programme. The status and value of interplanting shade trees with tea are being subjected to analytical study. The effects on yield, of artificial shade screens and of soil mulches in combination with differential fertilizer treatments cover certain aspects of such studies. The effects of shelterbelts—of *Hakea saligna* or of tea itself—are under scrutiny.

The Division also actively participates in the current scheme of extension experiments being conducted on several estates and designed to evaluate the influence of shade trees under a wide range of ecological regimes, covering the main tea-growing areas of Ceylon.

The Division also collaborates in studies concerning the early growth of vegetatively propagated tea plants in the nursery, seeking to assess the value of treatments such as hormone applications to encourage rooting and growth, and also on modified external conditions as a means of accelerating early growth.

The evolution of techniques for various assessments of physiological importance and the search for useful correlations between easily measurable parameters and total growth of tea at various stages are also under investigation.

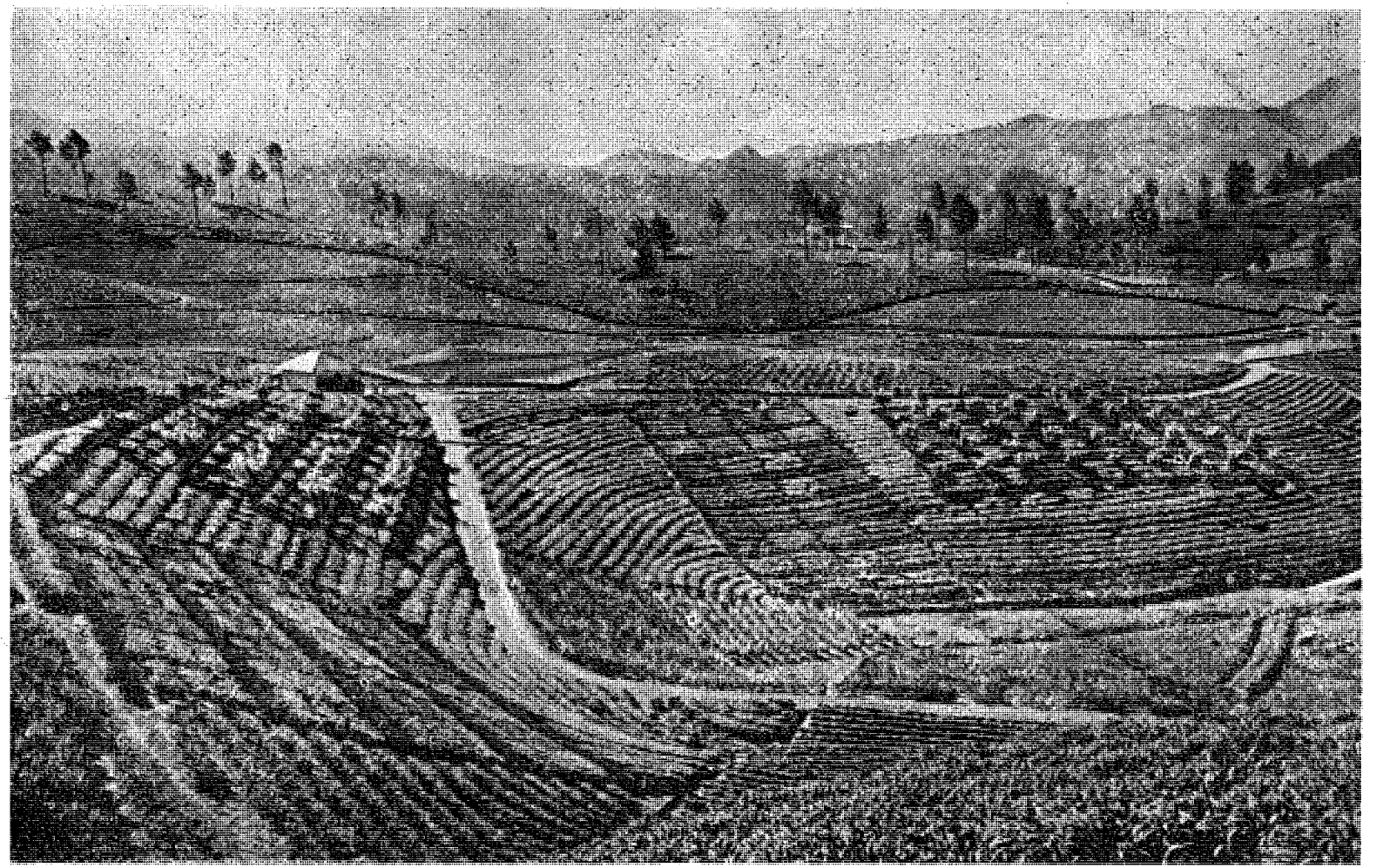

PLATE 11—*Experimental areas on No 3 Field at St Coombs*

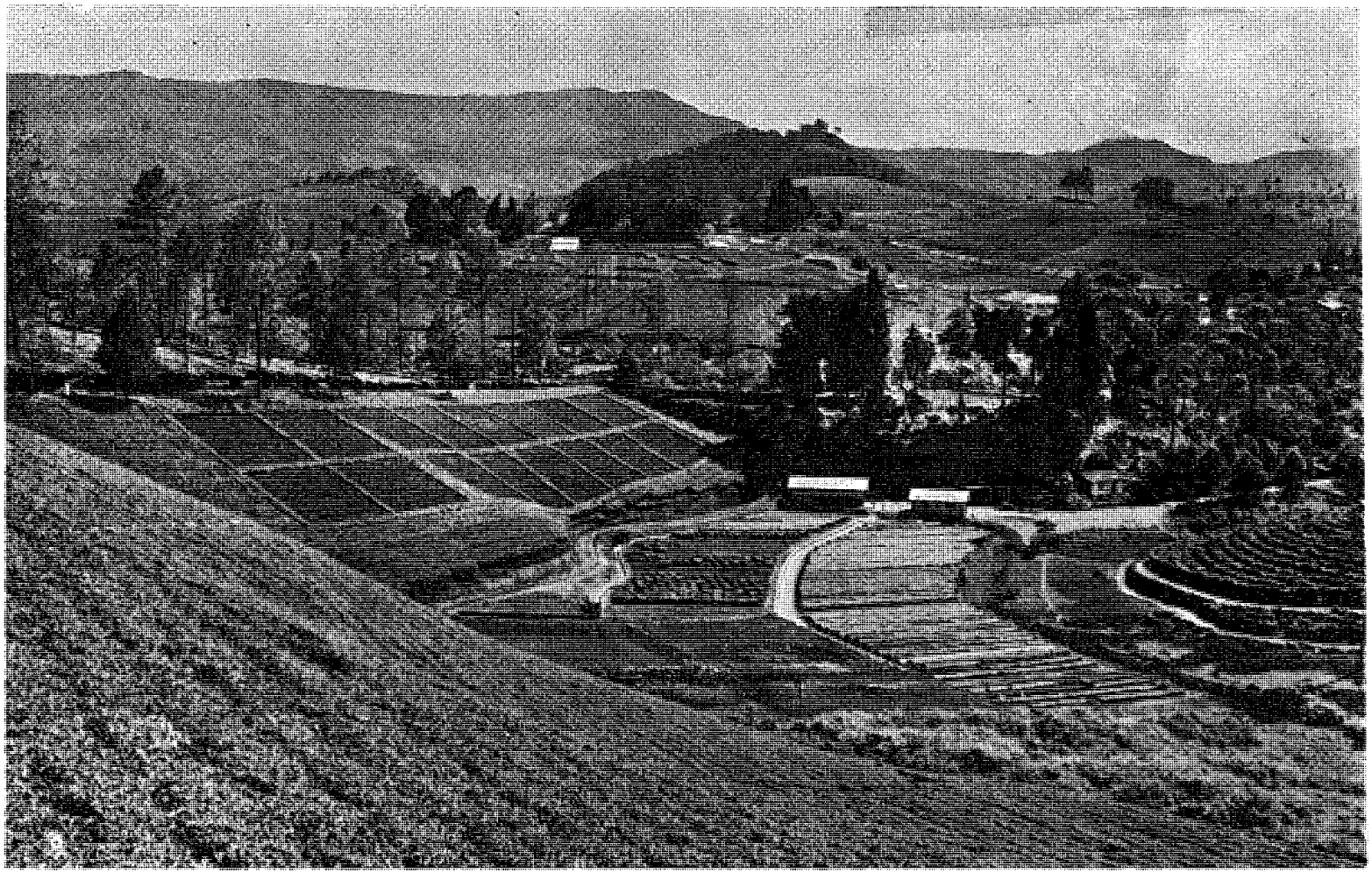

PLATE 12—*Central nursery and experimental areas on No. 16 Field at St Coombs*

PLANT PROPAGATION

The scope of activity of this Division concerns the vegetative propagation and breeding of tea, and the testing of clones.

Studies in nursery techniques for the vegetative propagation of tea at St Coombs (up-country), Kandy (Mid-country wet zone), Passara (Mid-country semi-dry zone) and Kottawa (Low-country) are in progress with a view to determining the optimum conditions of temperature, moisture, light intensity, soil pH, soil texture, etc necessary for satisfactory rooting of internodal tea cuttings in polythene sleeves.

Tests with different rooting media such as old tea soil, jungle soil, soil from Guatemala or Mana Grass fields, patana soil and subsoil indicate that old tea soils have no toxic effect as was previously believed and are just as suitable as Guatemala or Mana soils, while subsoil is satisfactory for rooting but not for subsequent vigorous shoot or root growth.

The selection of clones for high yield potential and leaf quality necessitates routine nursery tests for rooting ability because a clone which is a poor rooter is not suitable for large scale commercial propagation unless it is exceptionally high yielding or of very high quality or highly tolerant to pests and diseases.

Experiments to investigate the performance of different clones under different soil conditions have been laid out annually since 1961. The effect of shade is also being investigated. The total number of clones under test at present is about 100.

TRI clones of the 2020 series have given the highest yields. In nearly every case the acreage yield of all the unshaded clones has been significantly higher than from those under shade although certain individual clones may show the opposite tendency.

Studies are in progress on the effect of various methods of bringing tea into bearing treatments such as thumb-nailing on growth and yield of clones in the field.

Controlled pollination between selected high yielding and high quality clones with a view to the production of superior vegetative clones as well as generative clones yielding good biclonal seed.

The Division is responsible for the production of VP tea plants which amount to several thousands of each of different clones.

Advisory work on nursery techniques, clonal selection etc is undertaken where necessary in collaboration with the Advisory Division.

TECHNOLOGY

The Division is responsible for research on all aspects of the manufacture of tea, and now concentrates on both long and short term projects with the overall objectives of improving the quality of made tea, and reducing the costs of tea manufacture, with emphasis placed on automation.

Among the long term projects in progress are the development of a Rotorvane-CTC type of manufacture, and the use of triturators for the production of quality teas from both high and low grown leaf.

The Division is concerned with the development of basically new machinery such as driers and continuous rollers for producing teas with conventional characteristics, as a means of reducing costs of production and increasing efficiency. It is also concerned with the extrapolation of the TRI process for the production of soluble tea, to a large-scale commercial process.

The production of quality tea from leaf which has been traditionally assumed to lack certain desirable characteristics, eg the production of quality, or even flavour, from low grown leaf, is receiving attention.

The use of new fermentation techniques to achieve overall improvement of quality and ensuring uniformity of the product and the possibility of obtaining the same consistency throughout the year, is also being studied.

The short term projects which are sometimes carried out in collaboration with other Divisions include the evaluation of made teas from the fertilizer experiments, shade experiments, experiments with mechanical plucking, and also experiments designed to obtain information on the effect of plucking rounds and the type of plucked unit on made tea characteristics.

Routine testing for taints and residues of fungicides, pesticides, insecticides etc are carried out. Routine testing of TRI and estate clones is also being done at the St Coombs and other TRI Stations.

The Division operates an advisory service which is available to all tea factories in Ceylon. In instances where a problem cannot be adequately handled by correspondence, an officer of the Division would visit the factory by prior arrangement, and if necessary, carry out a complete check on manufacture and submit a report to the estate concerned.

The Division is responsible for operating St Coombs factory on commercial lines. One of the main objectives behind this is to ensure that research findings are translated to practical terms. A similar arrangement is operative in the low-country.

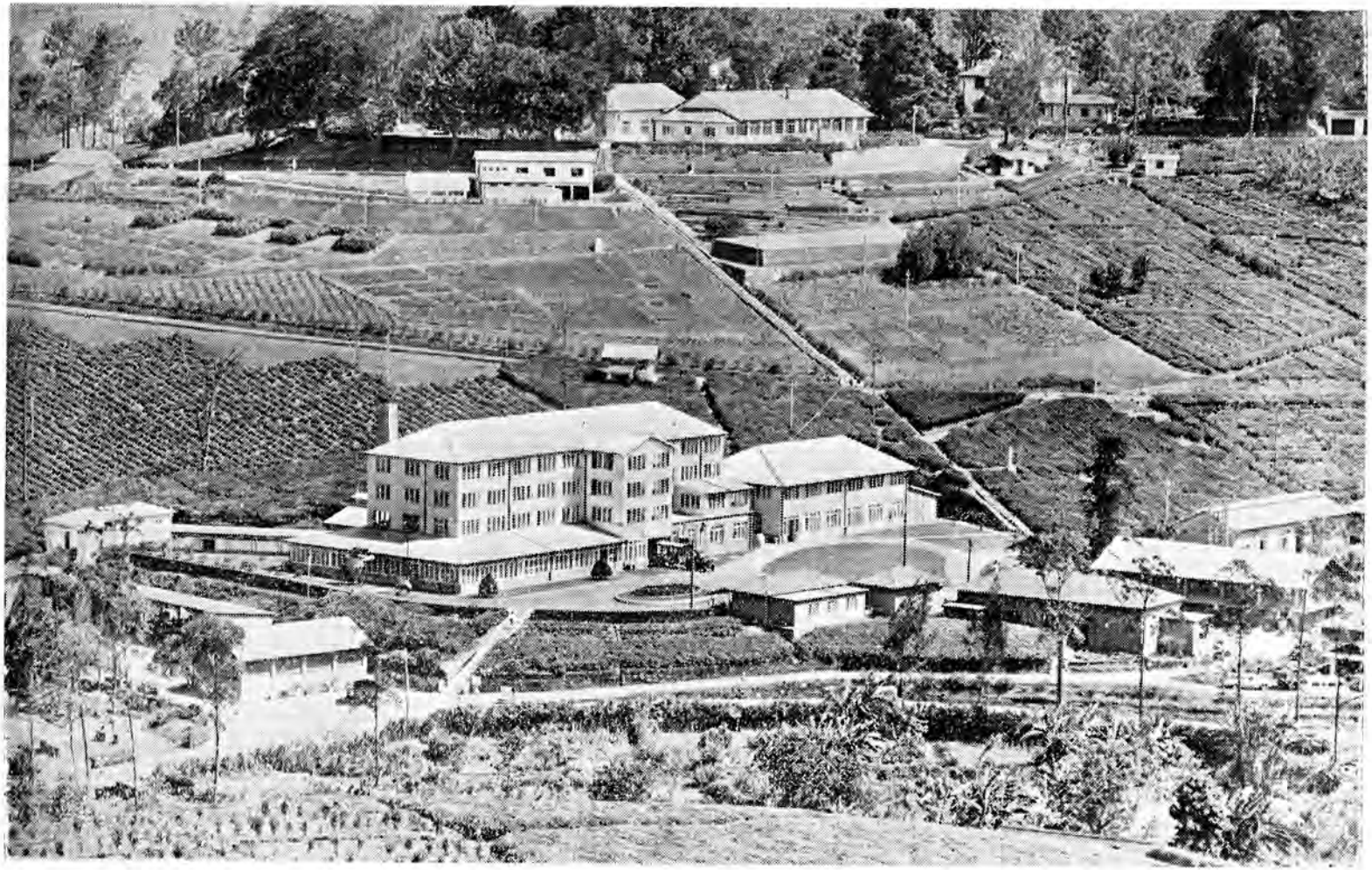

PLATE 13—*Laboratories of the TRI and St Coombs Factory*

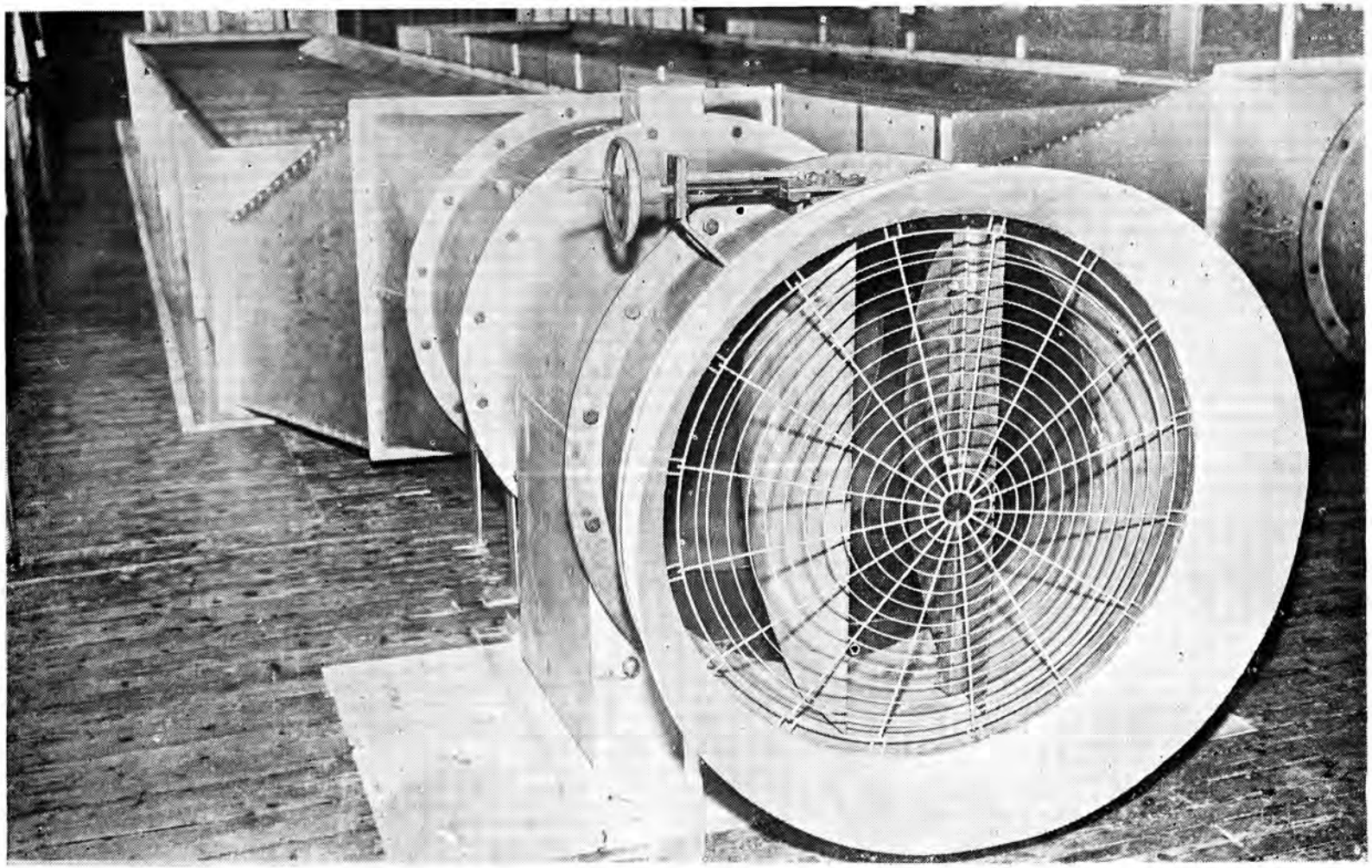

PLATE 14—*Trough withering section at St Coombs Factory*

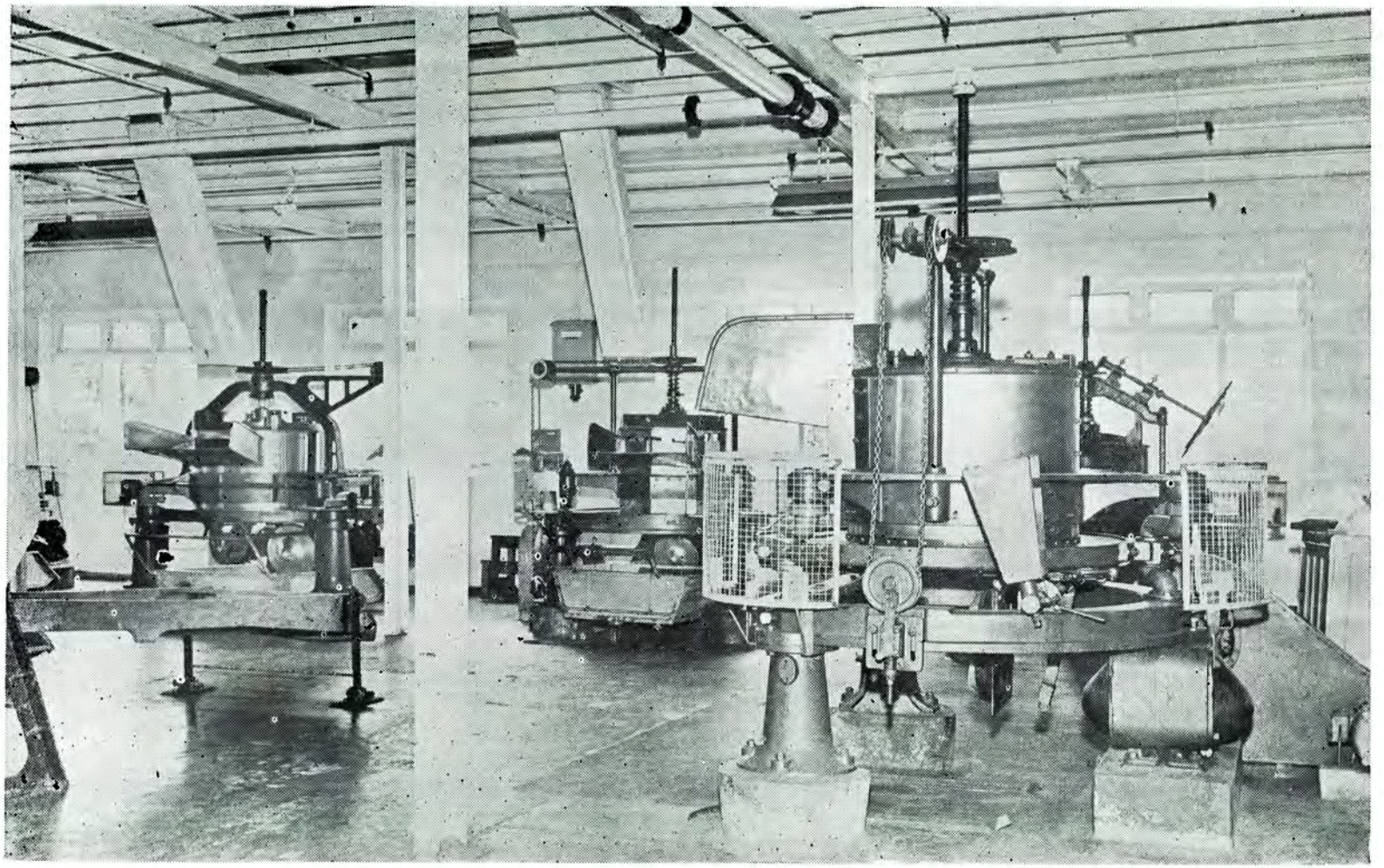

PLATE 15—*Rolling room at St Coombs Factory*

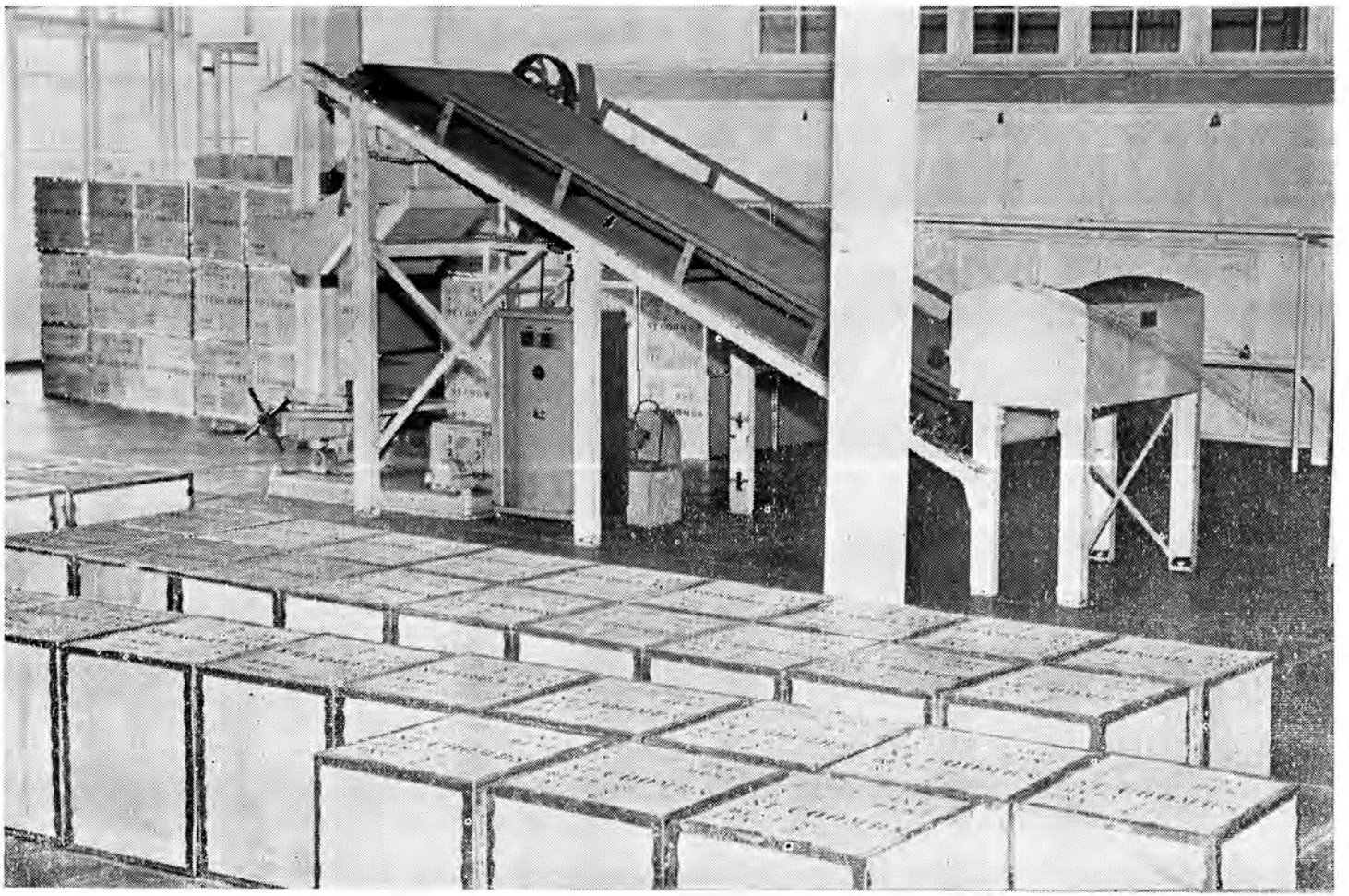

PLATE 16—*Tea from St Coombs Estate to be sold at the Colombo auctions*

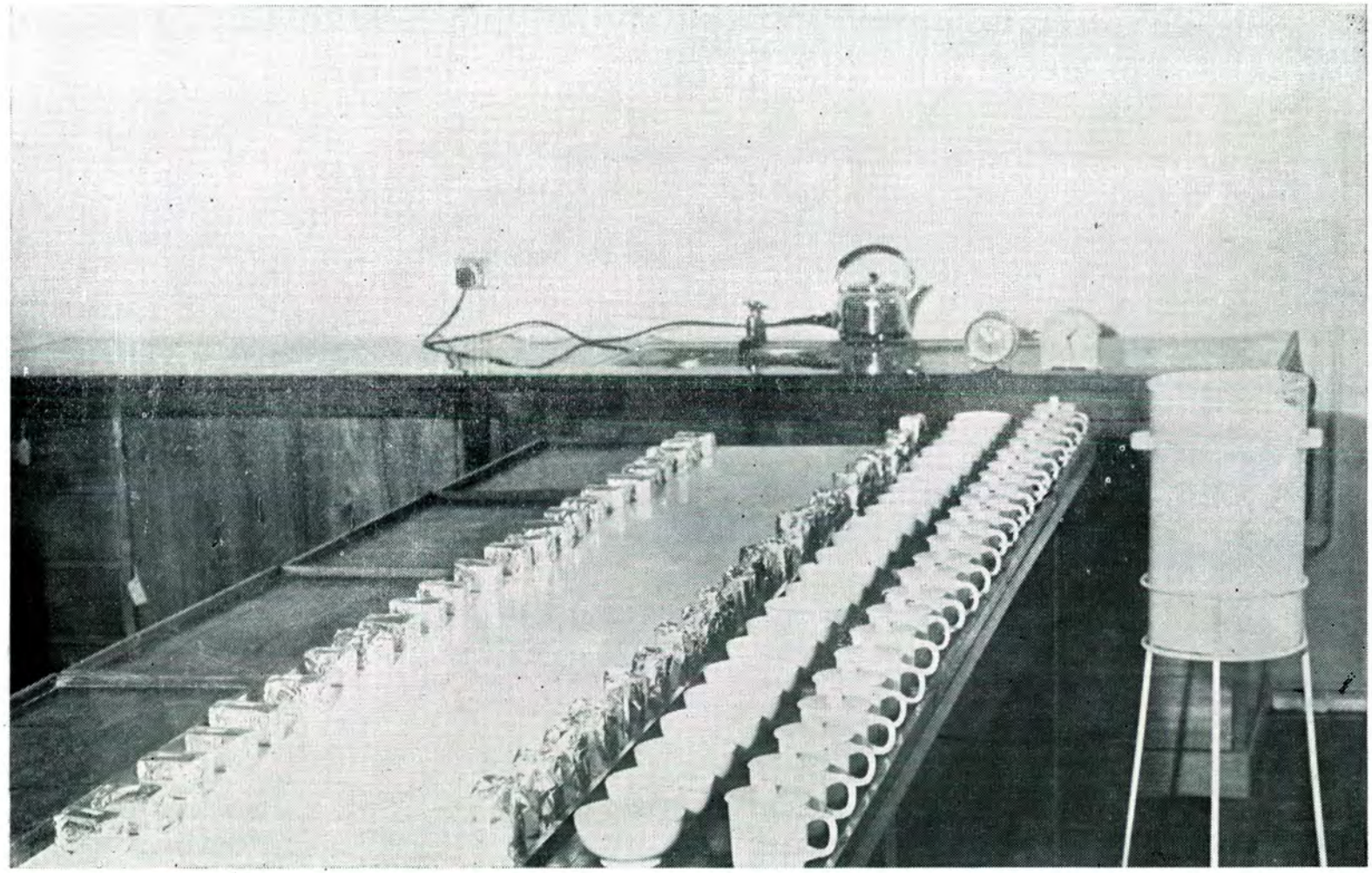

PLATE 17—*Tea Taster's laboratory at St Coombs factory*

STATISTICS

The Division was set up in 1961, its main function being to provide a continuous statistical service to all the other research divisions. This involves the designing of all the field and factory experiments to suit the objectives of each experiment. The design ensures that valid and accurate estimates of the effects of treatments could be made and that the reliability of these estimates could be assessed. The objectives themselves are largely directed towards making some practical recommendations to planters. In this case, the range of experiments are extended, wherever possible, to include experiments on estates as well. The objective is sometimes purely to gain an insight into some scientific phenomenon and in such circumstances the experiments are not repeated outside the Institute.

When the data have been collected—usually at the end of each pruning cycle—it is analysed by the Division, after which the conclusions are set out with their statistical interpretations. Eventually, of course, each research division would give meaningful interpretation to the results in terms of its own discipline.

Besides the planning of experiments, the Division is also responsible for giving advice on the techniques of sampling especially of pests and diseases. This includes various methods of dealing with the discrete data so collected.

Finally, the Division also undertakes its own research programme, eg, the study of the efficiencies of various types of design and sampling procedures ; the period for which a calibrating variate, like pre-treatment data, could be used in the course of a pruning cycle to improve the accuracy of the results ; and methods of economizing the resources for experiments consistent with the entire research programme of the Institute.

The Division is sometimes called upon to undertake the study of data from estates which may be of special interest. The study of confidence limits to meteorological data is a case in point.

OUTSTATIONS

In addition to the central research organization at Talawakele, the TRI has five outstation establishments which cater to special problems which arise in other planting districts. Some account of the activity of these stations is given below in reports contributed by the officers in overall charge of the stations.

THE LOW-COUNTRY STATION

St Joachim, Ratnapura

St Joachim Estate was acquired in 1961, and the construction of the buildings for the Institute's Low-Country Station commenced in 1963. These include the research laboratory, the tea factory with facilities for experimental manufacture and houses for staff and labour. All buildings are now occupied. The Assistant Director of the Institute is in overall charge of the Station.

The 416 acre property has 266 acres of seedling tea and 45 acres of VP tea in various stages from planting available in their entirety for experimentation. The factory also manufactures surplus green leaf from the estate, which is not needed for immediate experimentation. These teas are sold at the Colombo auctions.

The Superintendent is responsible for the working of St Joachim Estate. A full-time advisory officer was appointed in 1964, to serve the low-country districts.

The Kottawa Substation

A Substation for the Galle district was opened at Kottawa, Talgampola, in 1961. It is now 60 acres in extent, 40 acres of which have so far been planted in VP tea. Six acres of 10-year old seedling tea have also been purchased. The buildings on the Station include a Technology Unit for experimental manufacture.

The Low Country Station at Ratnapura and its Substation at Kottawa, Galle, serves the planting districts of Balangoda, Galle, Kalutara, Kegalla, Kelani Valley, Morawak Korale, Rakwana and Ratnapura. An advisory service is provided and extension experiments have been set down on many estates. Field experiments are being carried out at the Low Country Station and the substation at Kottawa.

In several experiments the effects of nitrogen, phosphorus, potassium, magnesium, zinc and lime are studied. Forms and levels of nitrogen and the frequency of application are being determined at various locations.

The rehabilitation of tea land prior to replanting in tea is a subject of study at St Joachim. For this purpose, Guatemala Grass and various species of legumes have been grown. The period of rehabilitation and the fertilizers required during the rehabilitation period are also being determined. Plots without any rehabilitation are being compared with those which are rehabilitated.

Eighty VP clones are under test both at St Joachim and Kottawa. The performance of these clones with and without shade is being examined. In addition, the more promising clones are being tested at various levels of nitrogen and of shade to determine more precisely how these clones are best grown on estates.

Selections have been made in seedling fields and from the progeny of biclonal crosses at St Joachim and clones derived in this way are being tested. An attempt is made to select drought tolerant clones for the Balangoda district where VP tea has succumbed to drought.

A wide range of herbicides has been tested on weeds both for their efficacy in controlling weeds and their phytotoxic effects on tea. Weed effects on the growth and yield of tea are also being studied.

Bringing-into-bearing, plucking, pruning and the duration of pruning cycle are subjects of investigation. Optimum spacings for various clones are being determined. Pruning of tea under low country conditions is receiving attention both in seedling as well as VP tea.

PLATE 18—*The TRI Low-Country Station — St Joachim Factory*

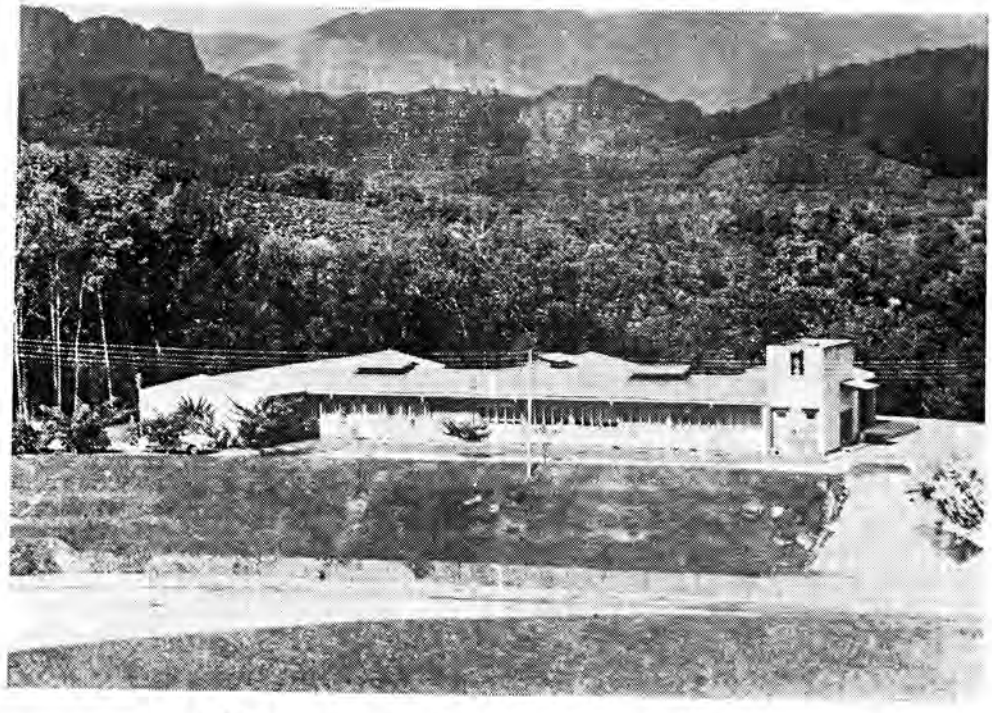

PLATE 19—*Laboratories at the TRI Low-Country Station, Ratnapura*

PLATE 20—*Staff bungalows at the TRI Low-Country Station, Ratnapura*

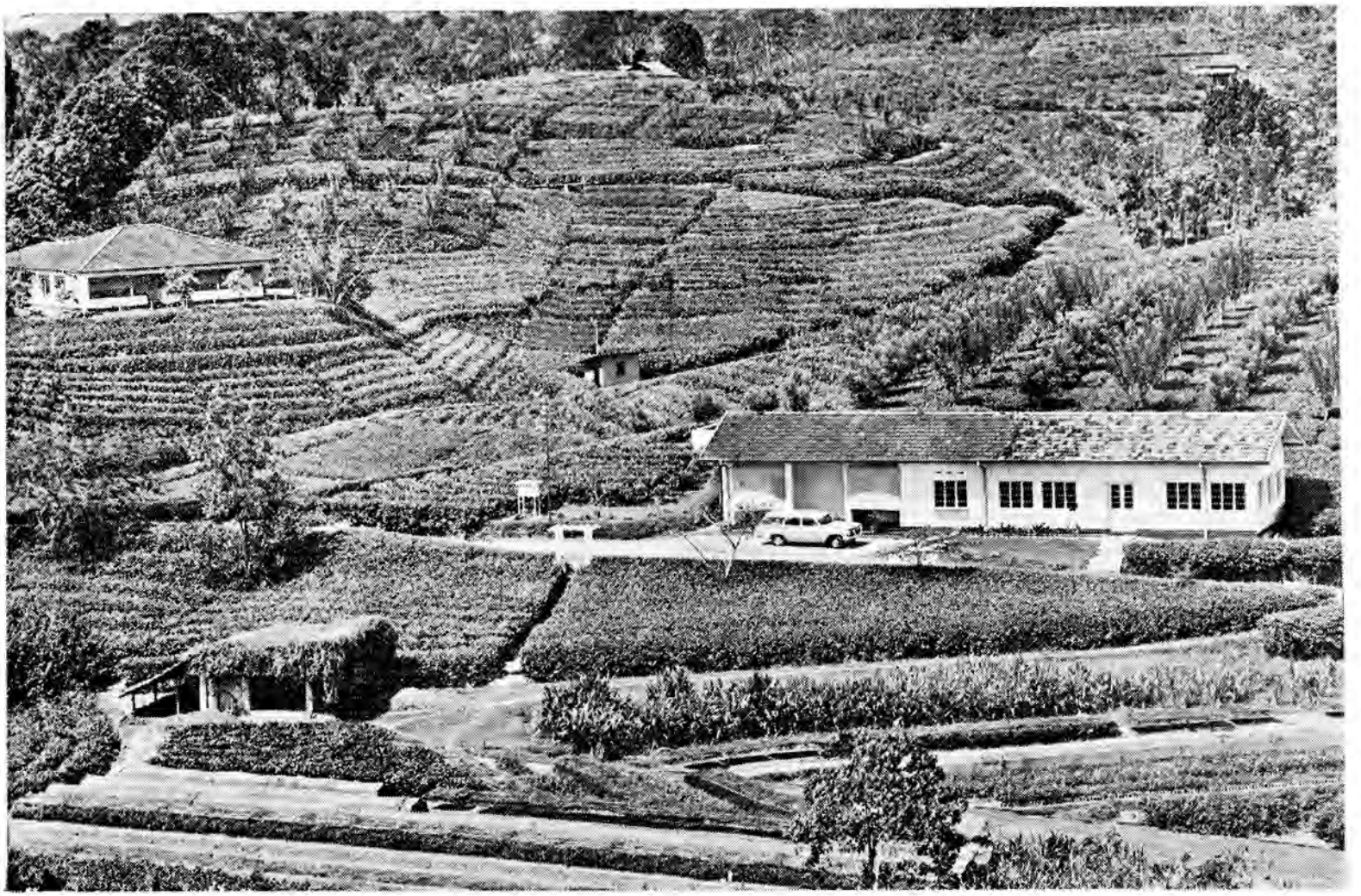

PLATE 21—*The TRI Kottawa Substation, Talgampola*

PLATE 22—*The TRI Mid-Country Station, Kandy*

THE MID-COUNTRY STATION

The Mid-Country Station, 56 acres in extent, was begun in 1960 as a clonal testing station. It has rapidly developed since, into a centre of research and advisory activity to cater to the special interests of the mid-country tea districts of the Central Province.

All research work being carried out at the Mid-Country Station is supplementary to that carried out by the main research station at Talawakele and its outstations.

The clonal testing work is far advanced in its agricultural aspects. Eighty tea clones including several from mid-country estates are being tested along with proven TRI and estate clones, to determine their yield potential, manufacturing properties and ability to resist drought, pests and diseases under mid-country conditions. Research on nursery techniques continue and additional clonal material is being included from time to time.

The manufacture of teas from the experimental clones was begun in early 1966. The evaluation of the quality of clones, grown and manufactured under the mid-country conditions, is being done systematically and the results of these experiments should be valuable in deciding on the suitable clones for mid-country production.

With the appointment of a District Advisory Officer, in September 1966, it is now possible to pay greater attention to the agronomic problems of mid-country estates. A programme for the establishment of a well distributed series of extension experiments on mid-country estates has been drawn up and some of these experiments have already been laid out in collaboration with the research divisions concerned.

The establishment of the Ecological Entomology Research Unit at the Mid-Country Station in 1966 fulfilled a long-felt need for fundamental research into pest ecology in tea. Initially started as a project to study the population ecology of the Shot-hole Borer in 1962, it now conducts intensive research on insect pest populations. All possible fresh approaches for the control of the Shot-hole Borer by employing cultural, biological, insecticidal or a combination of all these control methods—' integrated control '—are being actively investigated.

THE UVA STATION

The Uva Station was established in Uva on Gonakele Estate in 1931, the objective being research into the problem of the control of nettle grubs. In later years the scope of research was extended to include the Shot-hole Borer, as well as fertilizer experiments. In 1955 with the establishment of district clonal testing stations, the area of land leased by the Tea Research Institute was gradually planted with different clones for testing their performance under Uva conditions. In 1963 with the decentralization of the Institute's Advisory Service the substation at Gonakele became the centre of advisory operations, along with clonal testing.

With advisory officers being stationed in different districts it was possible for the Institute to extend considerably its agricultural extension activities, with officers more familiar with local conditions. With decentralization it was also possible for advisory staff to transmit the findings of research to the Industry more efficiently while at the same time keeping the research staff informed of pressing problems in each district.

The scope of extension activities in Uva, covered normal advisory correspondence and visits, arrangements of symposia on popular subjects and an educational programme for Assistant Superintendents at sub-district levels. Field experiments are conducted by the advisory staff on the problem encountered with pruning, foliar applications of micro-nutrients especially zinc, and plucking rounds. In addition, advisory staff co-operate with research officers from Talawakele to find locations for their experiments, and also help with assessments *etc.*

With the implementation of the extension experiment scheme on estates in 1965, field experiments have been established on a number of estates, into the problems of fertilizer levels and shade.

It was felt for some time that the Institute did not have sufficient land area in Uva for extensive experimental work, and that the weather conditions prevailing on the Gonakele Substation were not quite typical of Uva conditions. Since most of the problems in the Uva District, especially damage caused by the Shot-hole Borer is found at an elevation between 2000-3000 ft, a committee from the Uva Planters' Association have selected an area of land at this elevation with minimal rainfall on Agratenne Division of Ury Group, Passara. Although the land about 300 acres in extent, has not yet been transferred to the Institute, initial work on the uprooting of 20 acres tea land and planting with grass has already commenced. The planting of VP tea at the rate of 20 acres per year for experimental work is envisaged.

PLATE 23—*The TRI Gonakelle Substation, Debedde*

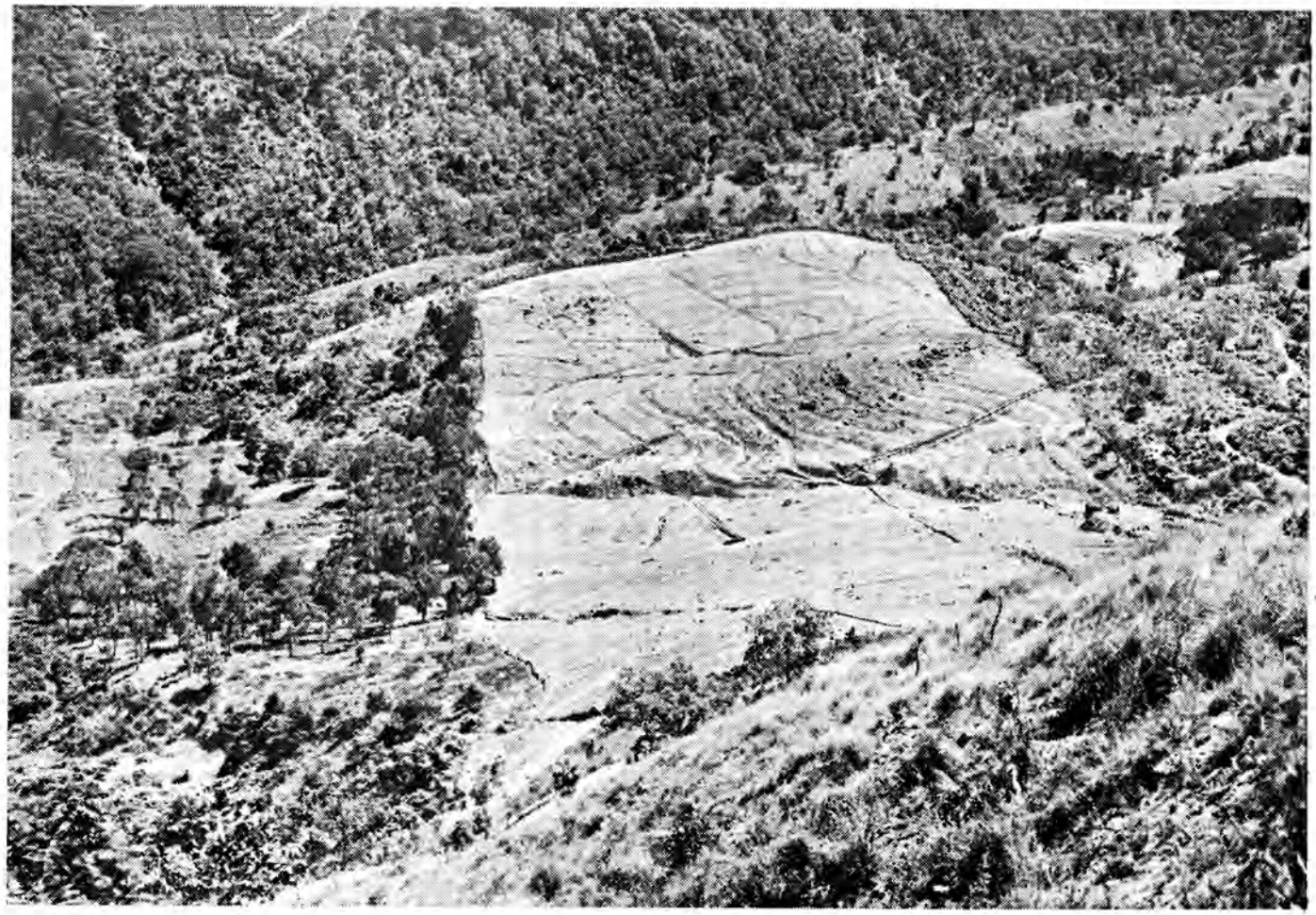

PLATE 24—*The TRI Agratenne Substation, Debedde*

THE ADVISORY SERVICE

The Advisory Division is primarily concerned with maintaining as close as possible contact with the tea planting industry in Ceylon and advising on all problems pertaining to cultivation of tea as distinct from problems pertaining to tea manufacture, which are dealt with separately by the Technology and Biochemistry Divisions.

Recommendations and information, based upon the most recent results of research provided by the research staff are published in the form of advisory pamphlets and leaflets by this Division.

Routine advisory matters are dealt with through an extensive correspondence, the visiting of estates, and the examination of plant and soil specimens, and over 60% of Ceylon tea estates of over ten acres in extent are thereby covered during each year. Routine advisory services provided by the Institute do not normally extend to small-holdings, a separate advisory service for which is provided by the Tea Control Department in Colombo, though the Institute may from time to time advise on matters relating to small holdings by special request from Government Departments concerned.

The headquarters of the Institute's advisory service are situated at St Coombs, and there are also district advisory services situated at the Institute's Low-Country Station at Ratnapura, and at its sub-stations at Passara and Kandy.

Advisory Centre		*Tea Districts served*
Talawakele	...	Ambagamuwa, Dickoya, Dimbula, Dolosbage, Kotmale, Maskeliya, Maturata, Nuwara Eliya, Pundaluoya, Ramboda and Udapussellawa
Ratnapura	...	Balangoda, Galle, Kalutara, Kelani Valley, Matara, Morawak Korale, Rakwana and Ratnapura
Passara	...	Badulla, Haputale, Madulsima, Moneragala, New Galway and Passara
Kandy	...	Alagalla, Dumbara, Hewaheta, Hunnasgiriya, Kadugannawa, Kandy, Knuckles, Madulkelle, Matale, Pussellawa, Rangala and Wattegama

The Advisory Division, works in co-operation with the Agricultural Chemistry and Plant Physiology Divisions, and estates, in the running of numerous shade and fertilizer extension experiments situated in various districts and localities. An important amount of extension work is concerned also with dissemination of information through study groups, the organization of field days and discussion groups for District Planters' Associations, training courses provided for District Field Officers and Tea Inspectors, lectures to visiting groups from educational establishments, contributions towards exhibitions and shows, the convening of conferences, and the maintenance of public relations with tea interests both in Ceylon and abroad.

PUBLICATIONS

The following publications are issued by the Institute :

1 — **The Tea Quarterly**—This is the scientific journal of the TRI, which reports experimental findings and also serves as a medium for transmitting the recommendations of the TRI to the Industry.

(Published quarterly @Rs 24/- per annum post-free for persons resident in Ceylon, India and Pakistan and £ 2 - 5 - 0 for those resident elsewhere. Single numbers can be obtained for Rs 6/- or 12s post free).

2 — **The Annual Report of the Tea Research Institute of Ceylon**—This report is published in two parts. Part I contains the Report of the Board and the financial statements of the TRI. Part 2 contains the reports of the Director, the Research Divisions, the Advisory Division, the TRI outstations and estates. It also includes the list of field experiments, trials and factory experiments carried out during the year.
(Published annually @ Rs 6/-).

3 — **Advisory Pamphlets**—These pamphlets are intended mainly for Superintendents of tea estates and educational institutions, and contain summaries of the Institute's recommendations on selected subjects.
(Published as and when they are considered necessary)

4 — **Monographs on Tea Production in Ceylon**—These books are published when sufficient information has accumulated on special topics to justify their publication. A list of the monographs already published is given below.

No 1— EDEN, T. (1949). ' The work of the Agricultural Chemistry Department of the Institute 78 pp.

No 2— GADD, C. H. (1949). " The commoner diseases of tea ". 94 pp.

No 3— LAMB, J. (1954). " Organization of tea research work in Ceylon with special reference to sub-stations and immediate expansion. 22 pp.

No 4— KEEGEL, E. L. (1956). " Tea Manufacture in Ceylon ". 179 pp. (Revised 1958).

No 5 KEEGEL, E. L. (Ed.) (1963). " A one-day course in Tea Manufacture conducted by the Technology Division of the Tea Research Institute of Ceylon ". 90 pp.

No 6— CRANHAM, J. E. (1967). ' Insect and mite pests of tea in Ceylon and their control. (In the press).

(Nos 1, 2 & 3 are now out of print. No 4 & 5 are available at Rs 10/- each. No 6 is to be published shortly).

5 — **Wall charts** These charts give summaries of the Institutes recommendations in a specially designed format.

(Published as and when they are considered necessary).

ADMINISTRATION

The Secretary of the Board is also the Chief Administrative Officer of the Institute. He is responsible for the implementation of the administrative and financial aspects of the policies laid down by the Board. He is also directly responsible for the works maintenance section. The Accountant is responsible to the Chief Administrative Officer for the finances of the Institute.

FIELD EXPERIMENTS, TRIALS AND FACTORY EXPERIMENTS CONDUCTED BY THE TEA RESEARCH INSTITUTE OF CEYLON FROM 1965

All field and factory experiments carried out by the TRI from 1965 onwards, at St Coombs Estate, St Joachim Estate, the TRI Stations at Debedde, Kandy and Kottawa, and on other estates are listed below. The year of commencement of each experiment is given in brackets. The following letters indicate the nature of the experiment :

A — Agricultural Chemistry and Agronomy
AYT — Agricultural Chemistry and Agronomy experiments on young tea
VP — Plant Propagation
PH — Plant Physiology
P — Plant Pathology
N — Nematology
E — Entomology
B — Biochemistry
T — Technology
S — Statistics
W — Experiments on Weeds and Herbicides
X — Extension experiments

Experiments on St Coombs and other estates in Dickoya, Dimbula, Nuwara Eliya and elsewhere will have no additional letters, if they are supervised by officers of the TRI at St Coombs. The centre from which each experiment is supervised is indicated by a preceding letter as follows :

L — Low-country (The Low-country Station at St Joachim Estate ; the Kottawa Sub-station and estates in the low-country)
M — Mid-country (The Mid-country Station and mid-country estates in the Central Province)
U — Uva (The Uva Station and estates in the Uva Province)

An extension experiment in Plant Physiology at the Uva Station for example, will have the letters **XUPH** or, an Agronomy experiment at St Joachim will carry letters **LA.** For further details of the experiments, refer Part 2 of the Annual Reports of the TRI for 1965 and 1966.

This list is complete up to 1.1.67

A1 — NPK—(*1931*)

A2 — NP Zn at No 9 Field —(*1962*)

A3 — Type of Zn at No 12 Field—(*1964*)

A4 — Type of Nitrogen at No 9 Field—(*1961*)

A5 — Frequency of application of Nitrogen at No 13 Field—(*1963*)

A6 — N timing at No 13 Field—(*1966*)

A7 — N distribution at No 13 Field—(*1964*)

A8 — NPK on Clone TRI 2024 at No 8 Field—(*1962*)

A9 — Clonal-spacing at No 2 Field and No 7 Field—(*1964*)

A10 — CAN S/A and Urea each at 3 levels and 3 levels of K on clone E 727 at Wallaha, Tangakelle Group, Lindula—(*1965*)

A11 — Boron and molybdenum on VP tea (clone TRI 2024)—(*1966*)

A12 — NPK at No 13 Field—(*1966*)

A13 — 3 levels of N, with 3 levels of shade on clones—(*1966*)

AYT1 — Potassium metaphosphate at 2 levels mixed and unmixed with soil at the bottom of the planting hole—(*1964*)

AYT2 — Hoof and horn meal and urea formaldehyde each at 2 levels mixed and unmixed with soil at the bottom of the planting hole—(*1964*)

AYT3 — Sulphate of ammonia at 4 levels on clone TRI 2023—(*1964*)

AYT4 — Sulphate of ammonia at 4 levels on clone TRI 2023—(*1964*)

AYT5 — Sulphate of ammonia and muriate of potash each at 3 levels applied in solution to the bottom of the planting hole—(*1964*)

AYT6 — Three levels and methods of placement of three phosphate fertilizers : superphosphates, saphosphosphate, potassium metaphosphate—(*1965*)

AYT7 — Type of N—(*1965*)

AYT8 — Type of N at Gouravilla Estate, Upcot—(*1965*)

AYT9 — Alkaline fertilizer—(*1965*)

AYT10 — Depth of holing—(*1965*)

AYT11 — Guatemala Grass root stock on young tea—(*1965*)

AYT12 — Guatemala Grass : NP Dolomite—(*1965*)

AYT13 — Rehabilitation—(*1965*)

AYT14 — S/A, urea formaldehyde and hoof and horn meal, 2 types of placement on 5 clones—(*1966*)

AYT15 — Ammonium *vs* nitrate nitrogen on 2 clones—(*1966*)

AYT16 — P,K, each at 2 levels and types of placement on 2 clones—(*1966*)

AYT17 — P,K, Mn each at 2 levels on 2 clones—(*1966*)

AYT18 — P,Zn on clones—(*1966*)

AYT19 — Nitrogen and nematodes on 2 clones (*1966*)

AYT20 — S/A, urea formaldehyde and isobutylidene diurea (IBDU)—(*1966*)

LA1 — NPKMg on seedling tea at Endane Estate, Kahawatte—(*1955*)

LA2 — NKMg and frequency of application on VP tea at Karapincha, Palmgarden Group, Ratnapura—(*1961*)

LA3 — NPKMg shade on seedling tea at the Low-Country Station, Ratnapura—(*1964*)

LA4 NPKMg on VP tea at the Kottawa Substation—(*1963*)

LA5 — Zn N frequency of application on seedling tea at the Low-Country Station, Ratnapura—(*1963*)

LA6 — Zn on seedling tea at Mahawela Estate, Ratnapura—(*1963*)

LA7 — Rehabilitation : species and fertilizer at the Low-Country Station, Ratnapura—(*1966*)

LA8 — Rehabilitation with legumes at the Low-Country Station, Ratnapura—(*1963*)

LA9 — Rehabilitation: species, fertilizer and duration at the Low-Country Station, Ratnapura —(*1965*)

LA10 — 6 clones at 3 levels of N and 3 levels of shade at the Low-Country Station, Ratnapura—(*1965*)

LA11 — Bringing into bearing, plucking, pruning, levels of N and duration of cycle in VP tea at the Low-Country Station, Ratnapura—(*1965*)

LA12 — 3 clones, 3 spacings and 3 levels of N at the Kottawa Substation—(*1961*)

LA13 — 3 clones, 3 spacings and 3 levels of N at the Kottawa Substation—(*1962*)

LA14 — Spacing and fertilizer on VP tea at the Low-Country Station, Ratnapura—(*1965*)

LA15 — Pruning of VP tea at the Low-Country Station, Ratnapura—(*1964*)

LA16 — NPKMg and frequency of application on VP tea at Hunuwella Group, Opanake—(*1965*)

LA17 — Types and levels of N, levels of dolomite on seedling tea at the Low-Country Station, Ratnapura—(*1965*)

LA18 — Rehabilitation with legumes at the Low-Country Station, Ratnapura—(*1965*)

LA19 — Bringing into bearing, plucking, pruning and duration of cycle in VP tea at the Kottawa Substation—(*1966*)

LA20 — NPKMg and frequency of application on VP tea at Ratnayaka Group, Deniyaya—(*1966*)

LA21 — NPKMg and frequency of application on VP tea at Kobomella Group, Beralapanatara—(*1966*)

LA22 — NPKMg and frequency of application on seedling tea at Anningkande Estate, Deniyaya —(*1966*)

LA23 — 3 types of N (Urea, CAN, S/A), 3 levels of N, 3 frequencies of application and 3 levels of lime on VP tea at Dankoluwa Estate, Pitabeddera—(*1966*)

LA24 — 3 types of N (Urea, CAN, S/A), 3 levels of N, 3 frequencies of application and 3 levels of lime on VP tea at Deniyaya Estate, Deniyaya—(*1966*)

LA25 — 3 types of N (Urea, CAN, S/A), 3 levels of N, 3 frequencies of application and 3 levels of lime on VP tea at Enselwatte Group, Deniyaya—(*1966*)

LA26 — Methods of pruning, frequency of plucking and duration of cycle on VP tea at Handford Estate, Deniyaya—(*1966*)

LA27 — Methods of pruning, frequency of plucking and duration of cycle on seedling tea at Anningkande Estate, Deniyaya—(*1966*)

LA28 — NPK types of N and levels of lime on VP tea at Hapugastenne Group, Ratnapura—(*1966*)

LA29 — NPK and frequency of application on seedling tea at Sapumalkande Group, Dehiowita—(*1966*)

LA30 — NPKMg and frequency of application on seedling tea at Talangaha Estate, Nakiyadeniya—(*1966*)

LA31 — 3 types of N (Urea, CAN, S/A), 3 levels of N, 3 frequencies of application and 3 levels of Dolomite on VP tea at Talangaha Estate, Nakiyadeniya—(*1966*)

LA32 — 3 types of N (Urea, CAN, S/A), 3 levels of N, 3 frequencies of application and 3 levels of Dolomite on VP tea at Talgaswella Estate, Talgaswela—(*1966*)

LAYT1 — S/A, CAN and urea formaldehyde placed in 3 different ways—(*1965*)

LAYT2 — Three levels and methods of placement of three phosphate fertilizers : superphosphate, saphosphosphate, potassium metaphosphate placed in 3 different ways—(*1965*)

LAYT3 — S/A, CAN and urea formaldehyde placed in 3 different ways—(*1966*)

LAYT4 — Three levels and methods of placement of three phosphate fertilizers : superphosphate, saphosphosphate, potassium metaphosphate placed in 3 different ways—(*1966*)

UA1 — Zinc sulphate at Demodera Group, Demodera—(*1964*)

UA2 — 6 clones at 3 levels of N with 3 levels of shade at the Agratenne Substation—(*1966*)

MA1 — N, K shade on seedling tea at the Mid-Country Station—(*1966*)

W1 — 3 levels of Simazine + Gramoxone on clone TRI 2142—(*1965*)

W2 — Simazine and Diuron on annual grasses (*Digitaria* spp.) in hand cleaned and Gramoxone treated blocks—(1966)

W3 — Simazine and Diuron on Buckwheat and Guatemala Grass, and also, Linuron and DCPA on Guatemala Grass—(*1966*)

W4 — Simazine and Diuron on the germination of *Crassocephalus crepidioides* seed in pots—(*1966*)

W5 — Simazine and Diuron on the germination of *Crassocephalus crepidioides* seed in the field—(*1966*)

W6 — Simazine, Diuron, Linuron, DCPA, Gramoxone and hand weeding on 1-year-old plants of clone TRI 2142—(*1966*)

W7 — Simazine, Diuron, Linuron, and DCPA on 3 clones at or near the time of planting—(*1966*)

W8 — Gramoxone + urea sprays on weeds—(*1966*)

W9 — Diuron and Linuron on Bamboo Grass in seedling tea after pruning—(*1966*)

W10 — Gramoxone on Guatemala Grass—(*1966*)

LW1 — Efficacy of herbicides on weeds in seedling tea at the Low-Country Station, Ratnapura—(*1964*)

LW2 — Some Triazines on weeds in seedling tea at the Low-Country Station, Ratnapura—(*1965*)

LW3 — Efficacy of Gramoxone, Diuron and Simazine, separately and in combination on weeds in seedling tea at the Low-Country Station, Ratnapura—(*1965*)

LW4 — Levels of Gramoxone on weed populations of various densities in seedling tea at the Low-Country Station, Ratnapura—(*1965*)

LW5 — Weed effects on the growth and yield of seedling tea at the Low-Country Station, Ratnapura—(*1965*)

LW6 — Biological assay of persistence of Simazine and Diuron in soil at the Low-Country Station, Ratnapura—(*1966*)

LW7 — Phytotoxicity of Gramoxone on young VP tea at the Low-Country Station, Ratnapura—(*1966*)

LW8 — Effects and interactions of (a) levels of Gramoxone and volumes of spray (b) levels of Gramoxone and intervals between sprayings, on the control of *Paspalum conjugatum* at the Low-Country Station, Ratnapura—(*1966*)

MW1 — Gramoxone, hand weeding and N on seedling tea—(*1966*)

VP1 — Clonal testing—(*1961*)

VP2 — Clonal testing—(*1962*)

VP3 — Clonal testing—(*1963*)

VP4 — Clonal testing—(*1964*)

VP5 — Clonal testing—(*1965*)

VP6 — Nursery testing of clones—(*1965*)

VP7 — Suitability of different rooting media—(*1964*)

VP8 — Phosphates on rooting of cuttings—(*1965*)

VP9 — Rooting potential of cuttings taken from mother bushes pruned every month in the year—(*1964*)

VP10 — Selection from open-pollinated clonal seedlings—(*1962*)

VP11 — Selections from hand-pollinated seedlings—(*1963*)

VP12 — Selections from biclonal progeny TRI 2023 × TRI 2026—(*1964*)

VP13 — Seedling progeny from 8 commercial seed gardens—(*1965*)

VP14 — Hand-pollinated seedlings—(*1965*)

VP15 — Field selection at No 11 and No 14, fields St Coombs—(*1964*)

VP16 — To test the viability of seeds stored under different temperatures and different periods of time—(*1965*)

VP17 — Clonal testing—(*1966*)

LVP1 — Clonal testing at the Kottawa Substation—(*1961*)

LVP2 — Clonal testing at the Kottawa Substation—(*1962*)

LVP3 — Clonal testing at the Kottawa Substation—(*1963*)

LVP4 — Clonal testing at the Kottawa Substation—(*1964*)

LVP5 — Clonal testing at the Kottawa Substation—(*1964*)

LVP6 — Clonal testing at the Low-Country Station, Ratnapura—(*1964*)

LVP7 — Clonal selection at the Low-Country Station, Ratnapura—(*1965*)

LVP8 — Clonal selection at the Kottawa Substation—(*1966*)

LVP9 — Clonal selection for drought resistance at Rye Estate, Balangoda—(*1966*)

UVP1 — Clonal testing at the Uva Station—(*1961*)

UVP2 — Clonal testing at the Uva Station—(*1962*)

UVP3 — Clonal testing at the Uva Station—(*1963*)

UVP4 — Monthly pruning of mother bushes at Cannaverella Group, Namunukula—(*1965*)

UVP5 — Monthly pruning of mother bushes at Mahadowa Group, Madulsima—(*1965*)

UVP6 — Performance of clones in soils of high acidity at Hugoland Estate, Udapussellawa—(*1965*)

UVP7 — Levels of fertiliser and clones at Mahadowa Group, Madulsima—(*1965*)

MVP1 — Clonal testing at the Mid-Country Station—(*1961*)

MVP2 — Clonal testing at the Mid-Country Station—(*1962*)

MVP3 — Clonal testing at the Mid-Country Station—(*1963*)

MVP4 — Clonal testing at the Mid-Country Station—(*1964*)

MVP5 — Clonal testing at the Mid-Country Station—(*1965*)

MVP6 — Clonal testing at the Mid-Country Station—(*1966*)

PH1 — Artificial shade—(*1961*)

PH2 — Mana and Guatemala as reconditioning grasses—(*1962*)

PH3 — Growth analysis—(*1965*)

PH4 — Types of pruning—(*1963*)

PH5 — Mulching—(*1965*)

PH6 — Hard pruning and methods of bringing into plucking—(*1964*)

PH7 — Growth in the nursery—(*1965*)

PH8 — The effect of varying duration of lung retention on recovery from pruning—(*1965*)

PH9 — Plucking rounds *cum* plucked unit—(*1965*)

PH10 — Timing of fertilizer applications and recovery from pruning—(*1965*)

PH11 — Growth substances and recovery from pruning—(*1965*)

PH12 — *Hakea saligna* as a ' shelter belt ' plant—(*1965*)

PH13 — Rested tea bushes as shelterbelts—(*1965*)

PH14 — Total available carbohydrate (TAC) levels and recovery from pruning—(*1964*)

PH15 — Quantities of TAC and recovery from pruning—(*1965*)

PH16 — Time of pruning at Moolgama Estate, Panwilatenne—(*1965*)

PH17 — Dieback after pruning at New Peacock Group, Pussellawa—(*1965*)

PH18 — Dieback after pruning at Beaumont Group, Pussellawa—(*1965*)

PH19 — Dieback in relation to timing of fertilizer application at Beaumont Group, Pussellawa—(*1965*)

LPH1 — Methods of pruning VP tea at the Low-Country Station, Ratnapura—(*1965*)

LPH2 — Methods of pruning seedling tea at the Low-Country Station, Ratnapura—(*1966*)

LPH3 — Duration of lung retention on recovery from pruning and yield in seedling tea at the Low-Country Station, Ratnapura—(*1966*)

UPH1 — Plucking frequency—(*1965*)

UPH2 — Time and type of pruning at Batawatte Group, Madulsima—(*1965*)

UPH3 — Time and type of pruning at Dammeria Group, Passara—(*1965*)

UPH4 — Time and type of pruning at Hopton Group, Lunugala—(*1965*)

UPH5 — Time and type of pruning at Demodera Group, Demodera—(*1965*)

UPH6 — Time and type of pruning at Dyraaba Group, Bandarawela—(*1965*)

MPH1 — Mulching of young VP tea (Clone TRI 2025) at the Mid-Country Station—(*1966*)

P1 — Soil fumigation with Vapam for the control of *Poria* root disease at Kirimetiya Estate Galaha—(*1964*)

P2 — Soil fumigation with Vapam for the control of *Poria* root disease at St John del Rey Estate, Norwood—(*1964*)

P3 — Soil fumigation with Vapam for the control of *Poria* root disease at Templestowe Estate, Rozelle—(*1964*)

P4 — Soil fumigation with Vapam for the control of *Poria* root disease at Queensberry Estate, Kotmale—(*1964*)

P5 — Soil fumigation with Vapam for the control of *Poria* root disease at Bambrakelly Estate, Lindula—(*1964*)

P6 — Soil fumigation with methyl bromide for the control of *Poria* root disease—(*1964*)

P7 — Soil fumigation with methyl bromide for the control of *Poria* root disease at Mattakelle Estate, Lindula—(*1965*)

P8 — Soil fumigation with WN 12 for the control of *Poria* root disease—(*1965*)

P9 — Duration of survival of *Poria* in soil—(*1962*)

P10 — Survival of Poria in soil at different depths—(*1964*)

P11 — Resistance of clones to *Poria*—(*1964*)

P12 — Resistance of clones to *Poria*—(*1965*)

P13 — Selection of bushes resistant to *Poria* at Mattakelle Estate, Lindula—(*1964*)

P14 — Epidemiology of Blister Blight—(*1962*)

P15 — Fungicides for blister blight control—(*1965*)

P16 — Taint tests with new fungicides for the control of Blister Blight—(*1965*)

P17 — The effect of fungicides on the colour of infusions of made tea—(*1965*)

P18 — Clonal resistance, pathogenicity of fungal isolates to *P.theae* and effect of age—(*1964*)

P19 — Killing *Grevillea robusta* trees with arboricides—(*1965*)

P20 — Incidence of root diseases in tea following removal of shade trees by various methods—(*1965*)

P21 — To investigate the rate of spread of Oilspot Disease at Pedro Estate, Nuwara Eliya—(*1964*)

P22 — Control of Oilspot Disease by pruning at Pedro Estate, Nuwara Eliya—(*1964*)

P23 — Search for indicator clones for Phloem Necrosis Virus Disease at Eskdale Estate, Kandapola—(*1960*)

P24 — Seed Transmission of Phloem Necrosis Virus Disease—(*1958*)

P25 — Ten fungicidal treatments for the control of Blister Blight—(*1966*)

P26 — Loss of crop caused by Blister Blight on unshaded seedling tea—(*1966*)

P27 — Testing clones for tolerance to Phloem Necrosis Virus Disease at Pedro Group, Nuwara Eliya—(*1966*)

P28 — Hand picking, shearing and machine harvesting of seedling tea on yield and the characteristics of the made tea—(*1966*)

P29 — Hand picking, shearing and machine harvesting of VP tea (Clone TRI 2024) on yield and the characteristics of the made tea—(*1966*)

P30 — Loss of crop caused by Blister Blight on unshaded VP tea (Clone TRI 2024)—(*1966*)

P31 — Control of *Poria hypolateritia* in tea stumps with methyl bromide—(*1966*)

P32 — Killing *Grevillea robusta* trees with arboricides, and by ring-barking—(*1966*)

P33 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Duration of covering period—(*1966*)

P34 — Soil fumigation with methyl bromide for the control of *Paria hypolateritia* : Duration of covering period—(*1966*)

P35 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Duration of covering period—(*1966*)

P36 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Duration of covering period—(*1966*)

P37 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Lowest effective dosage—(*1966*)

P38 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Lowest effective dosage at Mattakelle Estate, Talawakele—(*1966*)

P39 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Lateral distribution of fumigant outside treated area—(*1966*)

P40 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Lateral distribution of fumigant outside treated area—(*1966*)

P41 — Soil fumigation with methyl bromide for the control of *Paria hypolateritia* : Planting time—(*1966*)

P42 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Effect on soil nitrogen—(*1966*)

P43 — Soil fumigation with methyl bromide for the control of *Poria hypolateritia* : Different types of covering materials—(*1966*)

P44 — Soil fumigation with methyl bromide for the control of *Rosellinia arcuata* Mattakelle Estate, Talawakele—(*1966*)

P45 — Resistance of clones to *Poria hypolateritia* : Pot experiment—(*1966*)

P46 — Studies on inoculum potential of *Poria hypolateritia*—(*1966*)

P47 — Soil fumigation with WN 12 for the control of *Poria hypolateritia*—(*1966*)

P48 — Soil fumigation with methyl bromide for the control of *Pratylenchus loosi*—(1966)

P49 — Soil fumigation with methyl bromide for the control of *Pratylenchus loosi*—(*1966*)

P50 — Effect of soil moisture on Collar and Branch Canker (*Phomopsis theae*) : Pot experiment—(*1966*)

P51 — Effect of soil type and different levels of moisture on Collar and Branch Canker (*Phomopsis theae*) ; Pot experiment—(*1966*)

P52 — 3 depths of holding using the Dolmar deeprooter — (*1966*)

P53 — Selection of bushes resistant to *Poria* at Le Vallon Group, Pupuressa—(*1966*)

LP1 — The effect of various sanitary treatments on maintenance-leaf fall—(*1964*)

LP2 — The effect of shade on maintenance-leaf fall at St Joachim—(*1964*)

LP3 — Rate of spread of cankers at Millakande Estate, Bulathsinghala—(*1964*)

LP4 — Inoculation experiments with the fungus *Botryodiplodia theobromae* at Millakande Estate, Bulathsinhala—(*1964*)

LP5 — Fertilizer contact with tea stems at Millakande Estate, Bulathsinhala—(*1964*)

LP6 — Pruning experiments for the removal of cankers at Millakande Estate, Bulathsinhala—(*1964*)

UP1 — Bringing into bearing by ' bending ' and ' cutting across ' at Downside Estate, Welimada—(*1963*)

UP2 — Bringing into bearing by ' bending ' and ' cutting across ' at Nayabedde Estate, Bandarawela—(*1963*)

UP3 — Seasonal variation in susceptibility of clone N 3 to *Phomopsis theae* at Nayabedde Estate, Bandarawela—(*1964*)

UP4 — Seasonal variation in susceptibility of clone TRI 2024 to *Phomopsis theae* at Demodera Group, Demodera—(*1964*)

UP5 — Seasonal variation in susceptibility of clone TRI 2023 to *Phomopsis theae* at the Uva Station—(*1965*)

UP6 — Seasonal variation in susceptibility of clone TRI 2024 to *Phomopsis theae* at Aislaby Estate, Bandarawela—(*1965*)

UP7 — Resistance of clones to *Phomopsis theae* at Nayabedde Estate, Bandarawela—(*1964*)

UP8 — Resistance of clones to Phomopsis theae at Glen Devon Estate, Halgranoya—(*1965*)

UP9 — Control of Collar and Branch Canker (*Phomopsis theae*) at St Leonards Estate, Halgranoya—(*1966*)

N1 — Resistance and tolerance of clones to *Pratylenchus loosi*—(*1962*)

N2 — Resistance and tolerance of seedlings to *Pratylenchus loosi*—(*1964*)

N3 — Field performance of clones resistant to *Pratylenchus loosi*—(*1964*)

N4 — Level of infestation of *Pratylenchus loosi* in estate nurseries—(*1965*)

N5 — DD and methyl bromide as soil fumigants against for *Pratylenchus loosi*—(*1965*)

N6 — Nursery infestation with *Pratylenchus loosi* carried in water—(*1965*)

N7 — Number of *Pratylenchus loosi* in infected soil during the rehabilitation period and after replanting—(*1964*)

N8 — Effect of 2 methods of uprooting tea on (*a*) survival of *Pratylenchus loosi* during rehabilitation period and (*b*) on the increase of *Pratylenchus loosi* after replanting—(*1965*)

N9 — The increase in population of *Pratylenchus loosi* following replanting on lightly infested soil—(*1964*)

N10 — Control of *Pratylenchus loosi* in mature tea by interplanting with marigolds—(*1962*)

N11 — Pot experiment on the influence of different soils on *Pratylenchus loosi*—(*1964*)

N12 — Dosage of methyl bromide for fumigation of nursery soil—(*1966*)

N13 — Fertilizer levels on the build up of the population of *Pratylenchus loosi*—(*1966*)

N14 — Levels of N, P & K on the pathogenicity of *Pratylenchus loosi* to tea—(*1966*)

N15 — Fumigation with different chemicals on the survival and build-up of the population of *Pratylenchus loosi*—(*1966*)

N16 — Fumigation of soil with different chemicals in standing tea on the survival of the population of *Pratylenchus loosi*, and the yield of tea—(*1966*)

LN1 — Pot experiment at the Lowcountry Station to determine if a strain of *Pratylenchus loosi* is adapted to low-country conditions—(*1964*)

LN2 — Levels of N, P & K on the pathogenicity of *Pratylenchus loosi* to tea—(*1966*)

UN1 — Levels of N, P & K on the pathogenicity of *Pratylenchus loosi* to tea—(*1966*)

MN1 — Levels of N, P & K on the pathogenicity of *Pratylenchus loosi* to tea—(*1966*)

E1 — Dieldrin, aldrin and Telodrin as post-pruning sprays for shot-hole borer control at Gallebodde Estate, Galaboda—(*1962-1965*)

E2 — Dieldrin and Telodrin as post-pruning sprays for shot-hole borer control at Hantane Estate, Kandy—(*1963*)

E3 — Dieldrin and aldrin at 2 levels as post-pruning sprays for shot-hole borer control at Goorokoya Estate, Nawalapitiya—(*1963*)

E4 — Dieldrin and Telodrin at 2 levels as post-pruning sprays for shot-hole borer control at Ravenscraig Estate, Nawalapitiya—(*1963*)

E5 — Dieldrin at 1 level and aldrin and Telodrin each at 2 levels as post-pruning sprays for shot-hole borer control at Medecombra Estate, Watagoda—(*1963*)

E6 — Dieldrin, aldrin and Telodrin each at 2 levels as post-pruning sprays for shot-hole borer control at Downside Estate, Welimada—(*1963*)

E7 — Dieldrin and Telodrin at 2 levels as post-pruning sprays for shot-hole borer control at Goorokoya Estate, Nawalapitiya—(*1963*)

E8 — Dieldrin and aldrin at 2 levels as post-pruning sprays for shot-hole borer control at Demodera Group, Demodera—(*1963*)

E9 — Dieldrin and Telodrin at 2 levels as post-pruning sprays for shot-hole borer control at Moolgama Estate, Panwilatenne—(*1963*)

E10 — Aldrin at 2 levels as a mid-cycle spray for shot-hole borer control at Moolgama Estate, Panwilatenne—(*1964*)

E11 — Aldrin as a mid-cycle spray for shot-hole borer control at New Peacock Estate, Pussellawa—(*1964*)

E12 — Aldrin at 2 levels as a mid-cycle spray for shot-hole borer control at Blackwater Estate, Ginigathena—(*1964*)

E13 — Yield following dieldrin application for shot-hole borer control at Hantane Estate Kandy—(*1962*)

E14 — Yields following dieldrin application for shot-hole borer control at Bandarapola Estate, Matale—(*1962*)

E15 — Control of Shot-hole Borer by insecticides at Mount Vernon Estate, Patana—(*1964*)

E16 — Control of Shot-hole Borer by insecticides at Moolgama Estate, Panwilatenne—(*1964*)

E17 — Dieldrin spray volume for shot-hole borer control at Beaumont Estate, Pussellawa—(*1965*)

E18 — Control of Tortrix by insecticides at Waltrim Group, Lindula—(*1965*)

E19 — Effect of insecticides on the population of *Macrocentrus homonae*—(*1965*)

E20 — Copper and nickel fungicides on mite numbers (see **P15**)

E21 — Mite damage, shade and fertilizer on yield at Downside Estate, Welimada—(*1965*)

E22 — Susceptibility of clones to Scarlet Mite—(*1961*)

E23 — The effect of DDT plus acaricides on mite numbers at Dambawinne Division, Welimada Group, Welimada—(*1965*)

E24 — Control of mites with soap and 'Teepol' at Welimada Group, Welimada—(*1965*)

E25 — Biology and population dynamics of the Twig Caterpillar at Goorookoya Estate, Nawalapitiya—(*1965*)

E26 — Metacil, Unden, Vapona, Dipterex, Lebaycid, fenitrothion, DDT, Endrin and soap for the control of the Twig Caterpillar at Maha Uva Estate, Harasbedde—(*1966*)

E27 — Carbicron, Ciba C-8949, Sandoz 6538, Sevin, Birlane, Perthane, DDT and fenitrothion for the control of the Twig Caterpillar at Maha Uva Estate, Harasbedde—(*1966*)

E28 — Heptachlor at 2 levels and dieldrin for shot-hole borer control at Goorookoya Estates Nawalapitiya—(*1965*)

E29 — Mid-cycle applications of dieldrin, aldrin and heptachlor on shot-hole borer control, and tea yields at Kirrimittia Estate, Menikdiwela—(*1966*)

E30 — Biology and population dynamics of the Looper Caterpillar at Sapumalkande Es te Dehiowita—(*1966*)

E31 — Biology and population dynamics of the Twig and Looper Caterpillars at Mohamedi Estate, Lathpandura—(*1966*)

E32 — Birlane, Unden, Bidrin, Sumithion, Vapona and nickel chloride for shot-hole borer control at Deltotte Group, Deltota—(*1966*)

E34 — Levels of aldrin, dieldrin and heptachlor for shot-hole borer control in new clearings at Balangoda Group, Balangoda—(*1966*)

E35 — Three levels of heptachlor for shot-hole borer control at Balangoda Group, Balangoda—(*1966*)

E36 — Dipterex and DDT for tortrix control—(*1966*)

E37 — Metacil, Unden, Vapona, DDT and a mixture of Dipterex and Metacil for tortrix control—(*1966*)

E38 — Sandoz 6538 and DDT sprayed over a large area for twig caterpillar control at Maha Uva Estate, Harasbedde—(*1966*)

E39 — Parathion, methyl parathion, metacil, DDVP, DDT and Sandoz 6538 for twig caterpillar control at Maha Uva Estate, Harasbedde—(*1966*)

E40 — Dipterex and DDT when sprayed over a large area for tortrix control at Mattakelle Estate, Talawakele—(*1966*)

ME1 — Ecology of Shot-hole Borer—(*1962*)

ME2 — Clonal selection for shot-hole borer tolerance in experiments **MVP1** to **MVP6**—(*1966*)

ME3 — Shot-hole borer control on the response of tea to fertilizer—(*1966*)

ME4 — Shot-hole borer control on the response of tea to fertilizer at Bandarapola Group Matale—(*1966*)

ME5 — Biological *vs* insecticidal control of Shot-hole Borer—(*1966*)

B1 — Effect of irrigation on yield and quality—(*1965*)

T1 — Blending of clonal teas—(*1965*)

T2 — The effect of live shade in the field on the liquoring characteristics of tea—(*1965*)

T3 — Irrigation on clones—(*1965*)

T4 — Quality assessment of new clonal materials—(*1965*)

T5 — The effect of some foliar fungicidal sprays on liquoring characteristics—(*1965*)

T6 — Some comparisons between tat and trough withers—(*1964*)

T7 — Rate of withering—(*1965*)

T8 — Coarse leaf separation—(*1965*)

T9 — The effect of vane combinations, rotor shaft speed and pressure exerted by the end-plate on made tea characteristics—(*1964*)

T10 — The effect of the degree of wither on rotorvaned teas—(*1965*)

T11 — Rotorvane manufacture of China jat leaf and the effects of the floral and Iris end-plates—(*1965*)

T12 — Feeding rates and residence times of leaf within the Rotorvane—(*1965*)

T13 — Period of fermentation and its effect on liquoring properties of some clonal material—(*1965*)

T14 — Fermenting dhools on a porous surface—(*1964*)

T15 — Suitability of fibreglass as a fermenting surface—(*1965*)

T16 — The suitability of some locally available timber as battens for tea chests—(*1965*)

T17 — The suitability of rubberwood hardboard as panels for tea chests—(*1965*)

T18 — Handpicking, shearing and machine harvesting of seedling tea on yield and manufacturing properties (**P28**)—(*1966*)

T19 — Handpicking, shearing and machine harvesting of VP tea (Clone TRI 2024) on yield and manufacturing properties (**P29**)—(*1966*)

T20 — Plucking rounds *cum* plucked unit on made tea characteristics—(*1966*)

T21 — NPK on manufacturing properties—(*1966*)

T22 — Tat withering under controlled conditions of temperature, humidity and airflow rate—(*1966*)

T23 — The use of a Rotorvane Aerator—(*1966*)

T24 — Oxygen injection for Rotorvane manufacture—(*1966*)

T25 — The use of the trough fermenter with high grown leaf—(*1966*)

LT1 — The improvement of quality of low grown leaf—(*1966*)

LT2 — Rotorvane manufacture in the low-country—(*1966*)

LT3 — Tat withering under controlled conditions of temperature, humidity and airflow rate—(*1966*)

UT1 — Quality assessment of clones—(*1966*)

UT2 — Live shade in the field on the liquoring characteristics of tea—(*1966*)

UT3 — Plucking rounds *cum* plucked unit on made tea characteristics—(*1966*)

MT1 — Quality assessment of clones—(*1966*)

MT2 — Live shade in the field on the liquoring characteristics of tea—(*1966*)

MT3 — Insecticidal taints—(*1966*)

EXTENSION EXPERIMENTS

XA1 — CAN, S/A and urea each at 3 levels with shade on seedling tea at Tangakelle Group, Lindula—(*1965*)

XA2 — CAN, S/A and urea each at 3 levels with shade on seedling tea at Mayfield Estate, Kotagala—(*1965*)

XA3 — CAN, S/A and urea each at 3 levels with shade on seedling tea at Hauteville Estate Agrapatana—(*1965*)

XA4 — CAN, S/A and urea each at 3 levels without shade on seedling tea at Diyagama East Estate, Agrapatana—(*1965*)

XA5 — CAN, S/A and urea each at 3 levels without shade on clone TRI 2023 at Ederapolla Group, Bulathkohupitiya—(*1965*)

XA6 — CAN, S/A and urea each at 3 levels in combination with three levels of potash at Blairlomond Estate, Uda Pussellawa—(*1966*)

XA7 — CAN, S/A and urea each at 3 levels on soils adjusted to 3 levels of pH at Kirkoswald Group, Bogawantalawa—(*1966*)

XA8 — CAN, S/A and urea each at 3 levels in combination with three levels of potash at Brunswick Group, Maskeliya—(*1966*)

XA9 — CAN, S/A and urea each at 3 levels on soils adjusted to 3 levels of pH at Holyrood Estate, Talawakele—(*1966*)

XA10 — CAN, S/A and urea each at 3 levels in combination with 3 levels of potash at Clarendon Estate, Nanu Oya—(*1966*)

XA11 — CAN, S/A and urea each at 3 levels on Langdale Estate, Talawakele—(*1966*)

XA12 — CAN, S/A and urea each at 3 levels in combination with 3 levels of potash at Carolina Group, Watawala—(*1966*)

XA13 — CAN, S/A and urea each at 3 levels in combination with 3 levels of potash at Ottery Estate, Dickoya—(*1966*)

XA14 — CAN, S/A and urea each at 3 levels in combination with 3 levels of potash at Dickoya Estate, Dickoya—(*1966*)

XA15 — CAN, S/A and urea each at 3 levels in combination with 3 levels of potash at Kotiyagalla Estate, Bogawantalawa—(*1966*)

XA16 — CAN, S/A and urea each at 3 levels on soils adjusted to 3 levels of pH at Oonoogaloya Estate, Kotmale—(*1966*)

XA17 — CAN, S/A and urea each at 3 levels on soils adjusted to 3 levels of pH at Diyagama Estate, Agrapatana—(*1966*)

XA18 — CAN, S/A and urea each at 3 levels on soils adjusted to 3 levels of pH at Gonapitiya Group, Kandapola—(*1966*)

XLA1 — 3 types and 3 levels of N (Urea, CAN, S/A) and 3 levels of lime on VP tea at Hunuwella Group, Opanake—(*1965*)

XLA2 — 3 levels of N and 3 frequencies of application on VP tea at Hunuwella Group, Opanake—(*1965*)

XLA3 — 4 levels of N X 2 levels of shade on VP tea at Hunuwella Group, Opanake—(*1965*)

XLA4 — 4 levels of N X 2 levels of shade on seedling tea at Hunuwella Group, Opanake—(*1965*)

XLA5 — 3 types of N (Urea, CAN, S/A) and 2 levels of lime on VP tea at Endane Estate, Kahawatte—(*1965*)

XLA6 — 5 levels of N on VP tea at Endane Estate, Kahawatte—(*1965*)

XLA7 — 4 levels of N and 4 levels of shade on seedling tea at Rayigam Estate, Ingiriya—(*1965*)

XLA8 — 4 levels of N and 2 levels of shade on seedling tea at Hatherleigh Estate, Rakwana—(1965)

XLA9 — 4 levels of N and 2 levels of shade on VP tea at Millakande Estate, Bulathsinhala—(*1965*)

XLA10 — Types of N (CAN, S/A and urea) on VP tea at Wellandura Estate, Kahawatte—(*1966*)

XLA11 — 4 levels of N X 2 frequencies of application on 6 VP clones at Balangoda Group, Bogawantalawa—(*1966*)

XLA12 — 4 levels of N X 2 levels of shade on seedling tea at Sapumalkande Group, Dehiowita—(*1966*)

XLA13 — 4 Levels of N on TRI clones 2024, 2025 and 2026 at Berubeula Estate, Urubokka—(*1966*)

XLA14 — 4 levels of N X 2 levels of shade on VP tea at Ratnayaka Group, Deniyaya—(*1966*)

XLA15 — 4 levels of N X 4 levels of shade on seedling tea at Panilkande Estate, Deniyaya

XLA16 — 4 levels of N X 2 levels of shade on VP tea at Mahendra Estate, Morawaka—(*1966*)

XLA17 — 4 levels of N X 2 levels of shade on VP tea at Berubeula Estate, Urubokka—(*1966*)

XUA1 — 3 types of N at 3 levels at Aislaby Estate, Bandarawela—(*1965*)

XUA2 — NPK each 3 levels + control in all combinations at Aislaby Estate, Bandarawela—(*1965*)

XUA3 — 3 types of N at 3 levels at Hugoland Estate, Udapussellawa—(*1965*)

XUA4 — NPK each at 3 levels and control in all combinations at Hugoland Estate, Udapussellawa—(*1965*)

XUA5 — 3 types of N at 3 levels at Telbedde Estate, Badulla—(*1965*)

XUA6 — 3 levels of N and 3 levels of Limbux at Telbedde Estate, Badulla—(*1965*)

XUA7 — Guatemala, Mana and Napier as rehabilitation species at Telbedde Estate, Badulla—(*1965*)

XUA8 — 3 types of N at 3 levels at Nayabedde Estate, Bandarawela—(*1965*)

XUA9 — Guatemala, Mana and Napier as rehabilitation species at Nayabedde Estate, Bandarawela—(*1965*)

XUA10 — 3 levels of N X 3 levels of Limbux at Canavarella Group, Namunukula—(*1965*)

XUA11 — 3 types of N at 3 levels at Canavarella Group, Namunukula—(*1965*)

XUA12 — NPK each at 3 levels + control in all combinations at Spring Valley Group, Namunukula—(*1965*)

XUA13 — 3 types of N at 3 levels at Spring Valley Group, Namunukula—(*1965*)

XUAI4 — NPK each at 3 levels + control in all combinations at Kahagalla Estate, Haputale—(*1966*)

XUAI5 — 3 types of N at 3 levels at Kahagalla Estate, Haputale—(*1966*)

XMAI — CAN, S/A and urea each at 3 levels and 3 levels of K on seedling tea at Kelebokka Group, Madulkele—(*1966*)

XMA2 — CAN, S/A and urea each at 3 levels and 3 levels of K on seedling tea at Wattakelle Estate, Madulkele—(*1966*)

XMA3 — CAN, S/A and urea each at 3 levels and 3 levels of K on seedling tea at Hantane Estate, Kandy—(*1966*)

XPHI — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Liddesdale Group, Halgranoya—(*1965*)

XPH2 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Rothschild Estate, Pussellawa—(*1965*)

XPH3 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Mayfield Estate, Kotagala—(*1965*)

XPH4 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Hauteville Estate, Agrapatana—(*1965*)

XPH5 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Blairlomond Estate, Udapussellawa—(*1966*)

XPH6 — Shade *vs* no shade at Rothschild Estate, Pussellawa—(*1966*)

XPH7 — Shade *vs* no shade at Bogawana Group, Bogawantalawa—(*1966*)

XPH8 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Holyrood Estate, Talawakele—(*1966*)

XPH9 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Brunswick Group, Maskeliya—(*1966*)

XPHI0 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Morar Estate, Bogawantalawa—(*1966*)

XPHI1 — Shade *vs* no shade at New Peacock Group, Pussellawa—(*1966*)

XPHI2 — Nitrogen at 4 levels with shade *vs* no shade as the main treatments at Oonoogaloya Estate, Kotmale—(*1966*)

XLPHI — Shade *vs* no shade on seedling tea at the Low-Country Station, Ratnapura—(1966)

XUPHI — Shade *vs* no shade at Aislaby Estate, Bandarawela—(*1965*)

XUPH2 — Shade *vs* no shade at Nayabedde Estate, Bandarawela—(*1965*)

XUPH3 — Shade *vs* no shade at Gonakelle Estate, Passara—(*1965*)

XUPH4 — Shade *vs* no shade at Rookatenne Group, Hatton—(*1965*)

XUPH5 — Shade *vs* no shade at Neluwa Estate, Bandarawela—(*1965*)

XMPHI — 4 levels of N and 3 levels of shade on seedling tea at Kirimetiya Estate, Galaha—(*1966*)

XMPH2 — 4 levels of N and 3 levels of shade on seedling tea at Kellebokka Group, Madulkele—(1966)

XMPH3 — 4 levels of N and 3 levels of shade on seedling tea at Mausagalla Division, Kellebokka Group, Madulkelle—(*1966*)

XMPH4 — Shade *vs* no shade, Mahaousa Estate, Madulkele—(*1966*)

XP1 — Efficacy of ½ lb methyl bromide per 100 sq ft in controlling *Poria* at Bogawatte Estate, Dimbula—(*1965*)

XP2 — Efficacy of ½ lb methyl bromide per 100 sq ft in controlling *Poria* at Dunsinane Estate, Pundaluoya—(*1965*)

XP3 — Efficacy of ½ lb methyl bromide per 100 sq ft in controlling *Poria* at Kelaniya Estate, Maskeliya—(*1965*)

XP4 — Efficacy of ½ lb methyl bromide per 100 sq ft in controlling *Poria* at Kirkoswald Group, Bogawantalawa—(*1965*)

XP5 — Efficacy of ½ lb methyl bromide per 100 sq ft in controlling *Poria* at Rahanwatte Estate, Lindula—(*1965*)

XP6 — Fungicides for blister blight control at Lindoola Estate, Talawakele—(*1965*)

XP7 — Fungicides for blister blight control at St Coombs—(*1965*)

XUP1 — Fungicides for blister blight control at Hopton Group, Lunugala—(*1965*)

XUP2 — Fungicides for blister blight control at Dammeria Group, Passara—(*1965*)

XE1 — Heptachlor for shot-hole borer control at Talangaha Estate, Nakiyadeniya—(*1966*)

XE2 — Heptachlor for shot-hole borer control at Bopitiya Group, Galaha—(*1966*)

XE3 — Heptachlor for shot-hole borer control at Kelebokka Group, Madulkele—(*1966*)

XE4 — Heptachlor for shot-hole borer control at Dyraaba Estate, Bandarawela—(*1966*)

XE5 — Heptachlor for shot-hole borer control at Devon Estate, Talawakele—(*1966*)

XE6 — Heptachlor for shot-hole borer control at Chrystlers Farm Group, Kotagala—(*1966*)

XE7 — Heptachlor for shot-hole borer control at Downside Estate, Welimada—(*1966*)

XE8 — Heptachlor for shot-hole borer control at Deepdene Group, Rakwana—(*1966*)

XLE1 — Dieldrin and aldrin for shot-hole borer control on seedling tea at Hapugastenne Group, Ratnapura—(*1965*)

XLE2 — Dieldrin and aldrin for shot-hole borer control on seedling tea at Alupolla Group, Ratnapura—(*1965*)

XLE3 — Dieldrin and aldrin for shot-hole borer control on seedling tea at Hatherleigh Estate, Rakwana—(*1965*)

XLE4 — Dieldrin and aldrin for shot-hole borer control on seedling tea at Madampe Group, Rakwana—(*1965*)

XLE5 — Methods of dieldrin spraying for shot-hole borer control on seedling tea at Hapugastenne Group, Ratnapura—(*1965*)

XLE6 — Mid-cycle application of aldrin for shot-hole borer control on seedling tea at Hapugastenne Group, Ratnapura—(*1965*)

XLE7 — Mid-cycle application of aldrin for shot-hole borer control on seedling tea at Alupolla Group, Ratnapura—(*1965*)

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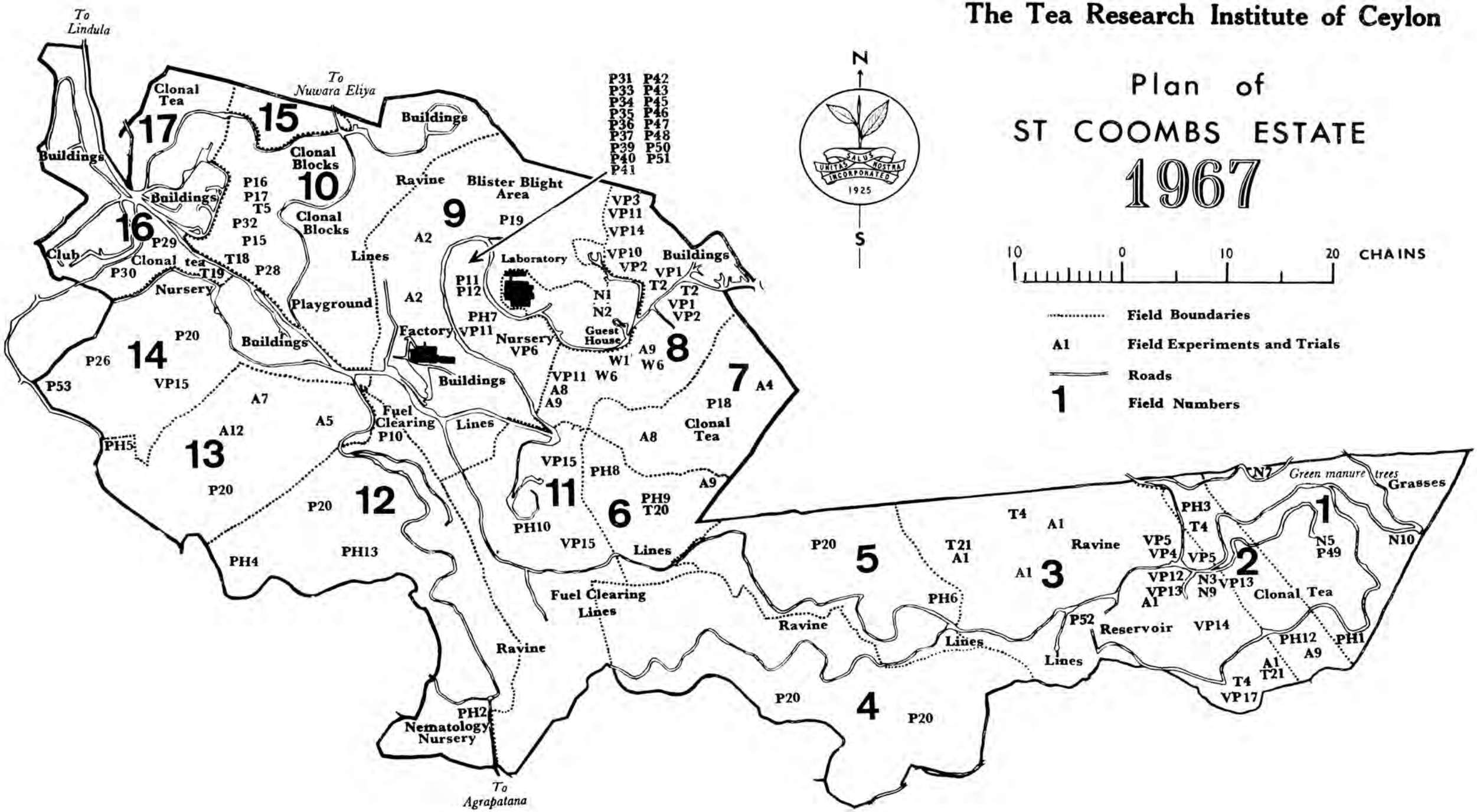
Plan of ST COOMBS ESTATE 1967



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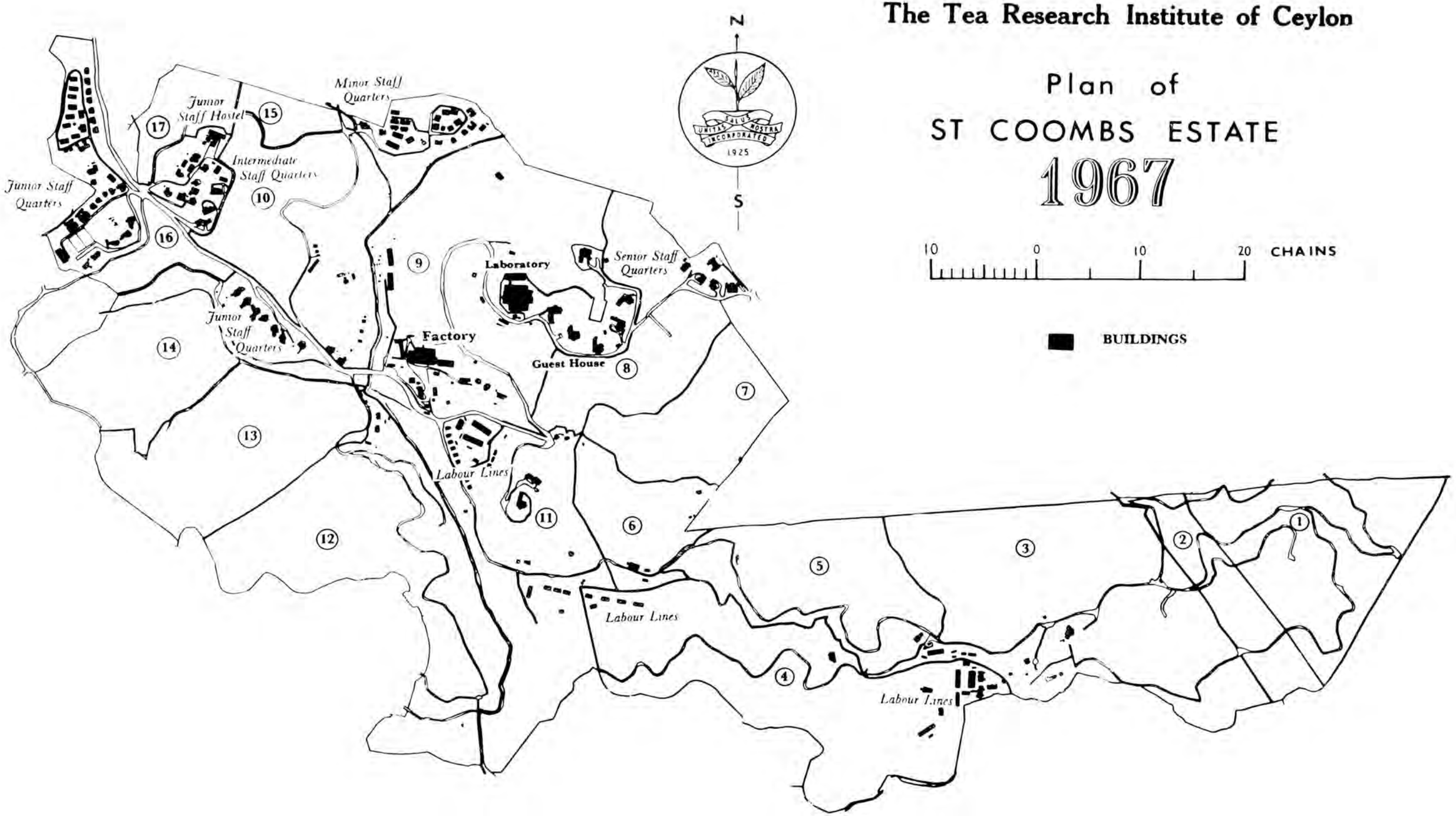
Plan of
ST COOMBS ESTATE
1967

10 0 10 20 CHAINS

BUILDINGS



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Plan of ST JOACHIM ESTATE 1967

10 0 10 20 CHAINS

N

S

LA15

XLPH1

7

LW3

LPH2

LPH3
LA19

6

5

4

LA17

LA5

LW1

LA9

LW5

LVP7

Clonal Tea

LA18

LA7

LA22

LW4

LA21

Nursery

LA8

2

Lines

LPH1

8

3

LW2

Factory

LA3

LP1

LP2

1

10

LA14

LA10

LA20

LA11

Clonal Tea

LVP6

To Ratnapura

9

Laboratory

Playground

Clonal Tea
LA23

..... Field Boundaries

A1 Field Experiments and Trials

Roads

1 Field Numbers

Buildings

CEYLON

N

S

0 10 20 30 40 MILES

EXTENSION EXPERIMENTS

carried out by the

TEA RESEARCH INSTITUTE OF CEYLON

Matale
XMA2
XMA1
XMPH4
XMPH2
XE3
XMPH3

Kandy
XMA3
XMPH1
XE2

XPH2
XPH6
XPH11
Nawalapitiya
XA5
XA18
XPH5
XUA5
XUA6
XUA7
Lunugala
XA16
XPH1
XA6
XUA3
XPH12
Badulla
XUP1
XLA13
XP1
XPH8
XP2
XA11
Nuwara Eliya
XUA4
XPH3
XA9
Avissawella
XUPH4
XA2
XE5
XUPH5
COLOMBO
XE6
XA10
XE7
XUPH3
XUPH1
XA12
XP5
XA1
XE4
XUA1
XUA12
XUP2
Hatton
XUA2
XUA13
XPH4
XA13
XA3
XUA10
XP3
XA14
XA7
XA4
XUA11
XUPH2
XUA8
XA8
XP4
XA17
XUA9
XPH9
XPH10
XPH7
XUA14
Haputale
XLA8
XLE1
XA15
XLA12
XUA15
XLE5
XLE6
XLE2
XLPH1
Ratnapura
XLE7
Balangoda
XLA10
XLA6
XLA7
XLA11
XLA1
XLA2
XLA3
XLE4
XLA4
XLA5
Rakwana
XE8
XLE3
XLA9
16
XLA15
Deniyaya
XLA14
XLA18
XLA17
XE1
Galle

The Tea Research Institute of Ceylon, Talawakele

The TRI Low-country Station, Ratnapura

The TRI Sub-stations