CEYLON COCONUT QUARTERLY

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CONTENTS

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REPORT OF THE CHAIRMAN FOR THE YEAR 1969

On 1st January 1969, the Coconut Research Board consisted of the following:—

Ex-Officio Members

Director of Agriculture—Mr. M. S. Perera.
Treasury Representative—Mr. C. A. Coorey.
Commissioner of Coconut Rehabilitation—Mr. C. Chanmugam.
Chairman, Low Country Products Association—Mr. T. C. A. de Soysa.
Director, Coconut Research Institute—Dr. W. R. N. Nathanael.

Nominated Members

Nominated by the Honourable Minister of Agriculture & Food from Senate and Members of Parliament—Mr. Festus Perera, M.P., Mr. J. L. Sirisena, M.P.

Nominated by the Planters' Association of Ceylon.
Mr. C. T. Van Geyzel, *J.P.*
Mr. B. Warusavitarne.

Nominated by the Low Country Products Association.
Mr. R. H. de Mel.
Mr. H. M. A. B. Fernando.

Nominated by the Honourable Minister of Agriculture & Food to represent Small Holders.
Mr. M. M. Kumarakulasingham.
Mr. S. B. Silva.

Secretary to the Board.
Mr. S. C. Kahawita.

On 1.4.1969 Mr. A. Aserappa was nominated by the Planters' Association of Ceylon in place of Mr. B. Warusavitharne.

On 1.4.1969 Mr. G. Hettiarachchi was elected Chairman of the Low Country Products Association and replaced Mr. T. C. A. de Soyza on the Board.

From 12th October 1969 Mr. H. Wickremasinghe replaced Mr. C. Chanmugam on the Coconut Research Board.

Meetings

Eleven meetings of the Coconut Research Board 224th, 225th, 226th, 227th, 228th, 229th, 230th, 231st, 232nd, 233rd and 234th were held on 31st January, 23rd February, 25th March, 7th May, 28th June, 20th July, 26th August, 24th September, 24th October, 22nd November and 15th December respectively.

A special meeting of the Coconut Research Board was held on 12th October 1969, to consider the proposals for the Rehabilitation of the Coconut Industry.

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Committees—Administrative Committee (as at 1st January 1969)

(1) Mr. R. H. de Mel (Chairman).
(2) Mr. C. A. Coorey.
(3) Mr. B. Warusavitharne.
(4) Mr. C. Chanmugam.
(5) Mr. H. M. A. B. Fernando.
(6) Mr. M. S. Perera.
(7) Mr. Festus Perera, M.P.
(8) Dr. W. R. N. Nathanael.

The 62nd and 63rd Meetings of the Administrative Committee were held on 22nd March and 12th December respectively.

Estates and Experimental Committee (as at 1st January 1969)

(1) Mr. M. M. Kumarakulasingham (Chairman).
(2) Mr. T. C. A. de Soyza.
(3) Mr. M. S. Perera.
(4) Mr. B. Warusavitharne.
(5) Mr. R. H. de Mel.
(6) Mr. C. T. Van Geyzel.
(7) Mr. J. L. Sirisena.
(8) Mr. S. B. Silva.
(9) Dr. W. R. N. Nathanael.

The 68th, 69th, 70th and 71st meetings of the Estates and Experimental Committee were held on 2nd March, 6th June, 11th August and 15th November respectively.

Extension Committee (as at 1st January 1969)

(1) Mr. C. T. Van Geyzel (Chairman)
(2) Mr. T. C. A. de Soysa.
(3) Mr. R. H. de Mel.
(4) Mr. C. Chanmugam.
(5) Mr. M. M. Kumarakulasingham.
(6) Mr. S. B. Silva.
(7) Dr. W. R. N. Nathanael.

The 52nd, 53rd, 54th, 55th and 56th meetings of the Extension Committee were held on 8th February, 1st April, 5th July and 17th October 1969 respectively.

Editorial Committee (as at 1st January 1969)

(1) Mr. M. M. Kumarakulasingham (Chairman).
(2) Dr. W. R. N. Nathanael.
(3) Mr. C. A. Wickremasuriya.
Mr. A. K. Gunapala (Secretary).

The 20th meeting of the Editorial Committee was held on 11th November 1969.

R. H. de MEL,
Chairman,
Coconut Research Board.

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REPORT OF THE DIRECTOR (1969)

1. STAFF

The staff of the Coconut Research Institute as at 1st January 1969, was as follows:—

Administration Division

Director—Dr. W. R. N. Nathanael, M.Sc., Ph.D. (Lond.), F.R.I.C.
Chief Administrative Officer and Secretary to the Board—Mr. S. C. Kahawita, B.Com. (Lond.), F.R.Econ.S.
Assistant Administrative Officer—Mr. T. T. A. J. C. Samarasinghe, Ll.B. (Cey.).

Soil Chemistry Division

Soil Chemist—Dr. D. A. Nethsinghe, B.Sc. (Cey.), D.Phil. (Oxon.), A.R.I.C.—(On overseas assignment with the I.A.E.A. since 1.10.66).

Acting Soil Chemist and Research Assistant—Mr. T. S. Balakrishnamurti, B.Sc. (Lond.), M.Sc. (Aberdeen).

Botany Division

Research Assistant—Mr. M. A. P. P. Manthriratne, B.Sc. (Lond.)—(On overseas Post-graduate training since 4.10.66).
Officer-in-Charge—Mr. R. B. Rodrigo.

Chemistry Division

Officer-in-Charge and Senior Technical Assistant—Mr. M. Jeganathan, B.Sc. (Lond.).

Agrostology Division

Research Assistant—Mrs. N. Rajaratnam, B.Sc. Hons. (Ceylon)—(On overseas Post-graduate training since 27.9.66).

Officer-in-Charge and Senior Technical Assistant—Mr. D. E. F. Ferdinandez, B.Sc. (Lond.).

Crop Protection Division

Crop Protection Officer—Dr. U. B. M. Ekanayake, B.Sc. Agric. (Cey.), D.Phil. (Oxon).

Biometrics Unit

Biometrician—Mr. V. Abeywardene.

Advisory Division

Chief Advisory Officer—Mr. C. A. Wickremasuriya, B.Sc. (Cey.).
Research Assistant—Mr. H. D. M. S. C. Samaranayake, B.Sc. (Poona).

Planting Division

Planting Officer—Mr. P. D. L. Fernando.
Assistant Planting Officer—Mr. C. W. S. de Silva.

Publications Unit and Library

Publication Officer—Mr. A. K. Gunapala, B.A. (Cey.).

2. GENERAL

1. Dr. M. A. P. Manthriratne was appointed Head of the Division of Botany and Plant Breeding with effect from 22nd October on his return from U.K., after successfully completing his Ph.D. Degree course in genetics at the Welsh Plant Breeding Station, Aberystwyth, Wales.

2. Mr. M. A. T. de Silva, Senior Technical Assistant, Soil Chemistry Division successfully completed his course of training at the Long Ashton Research Station, Bristol and resumed duties on 23rd June. He was awarded the M.Sc. degree of the University of London, and was promoted Research Assistant with effect from 1st January, 1970.

3. At the request of the University authorities in Reading Mrs. N. Rajaratnam, Research Assistant on overseas training was granted an extension of study leave by the Coconut Research Board from September 1969 to January 1970 to complete her programme of studies.

4. Dr. D. A. Nethsinghe, Soil Chemist, who was released by the Coconut Research Board to take up an assignment with the International Atomic Energy Agency in Vienna, continued to be away throughout the year.

5. Dr. W. R. N. Nathanael, Director, attended the Inaugural Session of the Asian Coconut Community held in Colombo from 2nd to 8th September.

6. A Field Day (organised in collaboration with the Ceylon Milk Board), on the management and production of pasture under Coconut was held at Bandirippuwa Estate on 4th June, 1969.

Coconut Crops

1969 has in general been a poor year for the coconut industry, which took a tumble in respect of both production and prices. The quantum of exports too plunged downwards accompanied by a fall in export earnings.

Ceylon's peak production of coconut estimated at 3,148 million nuts was recorded in 1964. The estimated production for 1969 is 2,616 million nuts representing a decrease of 16.9% from 1964 and 6.2% from the average production (of 2,789 million nuts) for the past 5 years. Further, the production figure for 1969 constitutes a decrease of 5.4% from the preceding year which has been estimated at 2,764 million nuts.

The reflection of the decrease in production in 1969 (from the preceding year) on the volume of exports amounts to 17.9%. In terms of the record and the average for the past 5 years the exports are lower by 44.3% and 24.4% respectively.

As regards the value of exports for 1969 a 1,000 nuts have averaged Rs. 248/80. The record for prices having been registered in 1968, this figure actually represents a decrease of 17.8% from both the previous year and the previous record. In terms of the average price for the past 5 years however, the 1969 value is higher by 17.1%.

Poor rainfall and the prolonged drought conditions that prevailed in most of the coconut growing areas during 1968 (combined probably with increasing senility of certain plantations) should account for the offset in overall production. It is unfortunate that a simultaneous drop in the export prices of all the coconut commodities has characterised the year under review. Some strategy to counter the plight is imperative and a systematic programme of replanting is doubtless a *sine qua non* if conditions of economic stalemate that loom large over the future of the coconut industry are to be averted.

3. VISITORS

The visitors to the Institute during the year included the following:—

Dr. A. F. Laidlaw, Chairman, Royal Commission on Co-operatives.
Dr. D. S. Rangarau, FAO, Regional Office, Bangkok.
Mr. L. H. Greenwood Barton, Tropical Products Institute, London.
Dr. W. H. Edwards, FAO, Rome.
Dr. S. S. Bains, I.A.R.I., New Delhi.
Dr. S. H. Wittwer, Michigan State University, U.S.A.
Mr. S. J. Stopforth, FAO, Rome.
Mr. Mohamed Sopiee, Malaysian High Commission.
Dr. G. Kemmler, Hannover, Germany.
Dr. V. M. Shorrocks, Borax Consolidated, London.
Dr. Carl F. Mattil, University of Texas, U.S.A.
Mr. J. O'Hagan, FAO/World Bank.
Dr. A. E. Gesmundo, Manila, Philippines.

4. PUBLICATIONS

Articles entitled "Coconuts in 1969" and "Activities of the Coconut Research Institute in 1969" were contributed to the Annual Report of the Planters' Association of Ceylon.

Two issues of the Ceylon Coconut Quarterly (Vol. XIX, No. 4, and Vol. XX, No. 1/2) were released during the year. Vol. XX, Numbers 3 and 4 were sent to the press.

One issue of the Ceylon Coconut Planters' Review (Vol. V, No. 4) was released during the year. Vol. VI, No. 1 was sent to the press.

Volume IV, No. 3 of the Sinhala Journal "Pol Pawath" was sent to the press.

5. STAFF RESEARCH CONFERENCES

Following the series of staff research conferences started in 1966, four Conferences were held during the year as follows:—

Quarter	*Date*	*Leader of Discussion*	*Subject*
First	29.3.69	Mr. D. E. F. Ferdinandez (O.I.C. Agrostology Division)	"Management Studies on *Brachiaria miliiformis* under Coconut".
Third	27.9.69	Mr. M. A. T. de Silva (Senior Technical Assistant)	"Micro-Nutrients in Plant Nutrition".
Fourth	7.10.69	Mr. W. V. D. Pieris (FAO Coconut Specialist)	"The Coconut industry in Producing Countries abroad".
Fourth	27.12.69	Mr. H. D. M. S. C. Samaranayake (Research Assistant)	"Village Surveys".

6. CYCLONE RELIEF SCHEME

During the year a Relief Scheme was launched by Government to assist owners of cyclone damaged coconut lands in the Chilaw District to rehabilitate their holdings.

Assistance under the Scheme (restricted to owners of coconut holdings 10 acres and under in extent) included the following:—

(i) Free Coconut seedlings (including free transport) to replace palms damaged by the cyclone.

(ii) A grant of Rs. 1/50 for each seedling planted in accordance with instructions issued by the CRI and

(iii) Under the U.K. FFHC, Cyclone Relief Aid—10 lbs. of free NPK fertilizer for each seedling planted.

The Field Staff of the CRI Advisory Division was deployed for carrying out the inspections, fertilizer issues and distribution of seedlings under this scheme, and the bulk of the work was satisfactorily completed by the end of the year. The records show that in all 911 applicants were issued 60,547 free seedlings and they were entitled to the cash subsidy and free fertilizer. Apart from these, 69 applicants were issued 17,502 seedlings, free of transport costs only, as they were owners of coconut lands over 10 acres in extent.

7. NOTES ON REPORTS OF DIVISIONS

The following notes draw attention to points of interest relating to the detailed reports of the Research and Extension Work of the Institute.

I. SOIL CHEMISTRY DIVISION

A. Field Experiments

1. The twelve long term field experiments at Bandirippuwa, Ratmalagara, Pothukulama, Bingiriya, Walahapitiya, Mawatte, Veyangoda, and Dondanduwa were maintained.

2. The observation trials on 'Leaf Scorch' at Elpitiya, nutrient deficiency in marine sands at Iranaville, and immature nut-fall at Palugaswetiya were maintained.

3. Two field experiments were conducted in the programme of isotope studies on the efficiency of fertilizer utilization by coconut palms.

4. Field experimental results of interest are:—

(i) Highly significant responses were obtained for potassium in the Response Curve Experiments on Adult Palms at Bandirippuwa Estate.

(ii) Highly significant response to phosphorus was maintained in (Manurial × Cultivation) Experiment, Ratmalagara Estate.

(iii) In the observation Trial at Iranaville Estate—on quarterly application of fertilizer, the yield of nuts has increased between 241% to 500% of the pre-treatment yields.

(iv) Response to liming was just significant and significant (placement × fertilizer) interaction was obtained in the Placement and Liming Experiment at Walahapitiya.

(v) *Experiment on Nitrogen Quality*—(Mawatte)

Urea was as efficient a source of nitrogen as ammonium sulphate on the lateritic gravel soil.

(vi) *Pothukulama Experiment—*

In manuring young palms, potassium and phosphorus have shown responses.

B. Laboratory Investigations

Soil Analysis:—Available phosphorus (Olsen's) was estimated on samples from the P32 Experiment at Marandawila and Mawatte Estates. Total Exchangeable Bases, Exchangeable Ca, Mg and K were also estimated.

Leaf Analysis:—Estimation of N, P, K, Ca and Mg in leaf samples from the field experiments at Marandawila (NPK, Mg) and Monrovia (NPK, Mg and B, Zn, S) estates.

P 32 Experiment:—Determination of radioactivity, total phosphorus and potassium in leaf samples.

C. Soil Survey

The regional soil survey of the coconut growing areas in the Eastern Province was continued.

Detailed soil survey of a selected area affected by the 'Leaf Scorch' disease was commenced and is being continued.

At the request of Government, soil surveys, to determine suitability of land for the cultivation of coconut, in Moneragala, Jaffna, and Puttalam districts were conducted.

Soil Surveys were also done at the request of Suprintendents or owners of tea and/or rubber estates.

II. DIVISION OF BOTANY AND PLANT BREEDING

1. Controlled Pollination Work

The production of high-yielding (Tall × Tall) and (Tall × Dwarf) seed material was continued at Bandirippuwa, Ratmalagara, Isolated Seed Garden, Marandawila, Achchitotam, Andigedera and Kiniyama Estates. A total of 171,254 female flowers were pollinated consisting of 112,729 (Tall × Tall) crosses where the male parent is a 'prepotent' and 58,525 (Tall × Dwarf) crosses. Besides the above, systematic emasculation of selected palms within a 5 acre dwarf plantation at the Seed Garden, Ambakelle, produces (Dwarf × Tall) seednuts resulting from natural cross-pollination with the tall variety. 23,608 (Tall × Tall), 14,518 (Tall × Dwarf) and 10,152 (Dwarf × Tall) seednuts were harvested during the year. 60,000 seednuts have been laid in the Bandirippuwa Estate research nurseries.

Fifteen private estates have been assisted to carry out their own programmes of controlled pollination work.

The demand for hand pollinated seedlings continues to be heavy and this year 21,400 were issued. This consists of 9,931 (Tall × Tall), 1,905 (Tall × Dwarf) and 9,565 (Dwarf × Tall) Seedlings.

2. Mother Palm Seed Supply

The Planting Division nurseries were supplied with 2,092,753 selected seednuts. Palm selection programmes were curtailed due to the effect of drought in most areas. Nevertheless, 1,900 additional mother palms were selected from Letchemy and Walahapitiya Estates, Nattandiya (Chilaw District).

3. Field Experiments

The field experiments and observation trials at Bandirippuwa (13), Ratmalagara (5), Walpita (1) and Pothukulama (9) were maintained throughout the year.

A new observation trial (6 acres) was planted at Bandirippuwa to compare the performance of (Tall × Dwarf) and (Dwarf × Tall) crosses of mixed parentage.

4. Coconut Seed Garden, Ambakelle

20,000 teak seedlings were planted in the Western isolation barrier recently freed of squatters. 50-75 acres remain for re-afforestation in 1970. Effects of drought have been particularly severe in Field No. 1.

III. CHEMISTRY DIVISION

1. Pot Culture Experiment

(i) The chemical examination of plant samples prepared from previous pot culture experiments was continued.

(ii) The first pot culture experiment (in a series to follow) involving 288 seedlings was laid down on 23rd October 1969, to study the pattern of *micro-nutrient* distribution in the various components of the seedlings for eight treatments (+ALL,-ALL,-N,-P,-K,-Ca,-Mg and -TE).

(iii) Preliminary experiments were carried out to observe the germination rate and subsequent growth performance of a random selection of seednuts (from the estate heap) sand cultured in Mitscherlich vessels.

2. Germination Experiment

(i) The eighth and final stage of the germination experiment that has been in progress for some years was completed during the year.

(ii) A nursery experiment was laid down to study the relative germination rates and subsequent growth performances of seedlings raised from different size categories of seednuts of the *typica* variety.

3. Correlation Studies on Drupe Components of the Coconut

Studies were initiated during the year to determine possible correlation factors between the weight and other physical characteristics of the pericarp components of the drupe and its endosperm elements.

4. Arrack

Twelve palms were continued to be tapped for toddy during the year. The samples collected were used for laboratory studies on fermentation efficiencies and the preparation and examination of experimental samples.

5. Coconut Varieties

Samples of copra prepared by the Division of Botany and Plant Breeding from varieties and forms of coconut grown in Ceylon were examined and reported on for oil content. This work is being continued.

IV. AGROSTOLOGY DIVISION

1. Soil Fertility Studies

During the year studies on the nutrient status of Attavillu soils were completed. All three soil types studied revealed acute deficiencies of N and K. While P was deficient only in the Kiulkelle and the Kallady components, it appeared to depress yields in the sandy soils from Madurankuliya. None of the minor nutrients tested was found to be deficient. The data are being studied in detail.

A soil type from the Kurunegala district at Mawathagama was sampled during the latter part of the year. Preliminary data indicate that the soil is deficient in N, P and K.

2. Pasture Studies

All long term experiments studying pasture—coconut competition and management studies of *B.miliiformis* under coconut were maintained during the year. In addition to these, the following experiments were commenced:—

(*a*) Response of Pangola grass to added levels of urea at different frequencies of cutting.

(*b*) Comparison of 13 pasture grasses for efficiency of Nitrogen recovery and persistence.

(*c*) Response of Pangola grass to different intensities of light and levels of added nitrogen.

(*d*) Response of *Setaria speculata* (variety Nandi) to different levels of applied nitrogen and heights of cutting.

(*e*) Methods of establishing a legume in an existing pasture of *B.miliiformis*.

(*f*) Effect of levels of nitrogen and frequencies of cutting on *B.miliiformis*.

In all the above experiments a quantitative study of the pasture harvested was made.

3. Cattle

The entire herd of cattle was immunised against Haemorrhagic Septicaemia during the year, after an outbreak of the disease resulting in the death of one bull calf. Milk production during the year was satisfactory.

V. CROP PROTECTION DIVISION

1. Breeding and release of parasites of the Coconut Caterpillar, *Nephantis serinopa* Meyr, were continued. Census data on the fluctuations of the population densities of the pest and parasites were recorded in four estates each, in the Eastern and North Western Provinces and in one estate in the Western Province.

2. Population studies on the Coconut Scale, *Aspidiotus destructor* Sign., and the Black (Rhinoceros) Beetle, *Oryctes rhinoceros* L. were in progress.

3. *Platymeris levicollis* a predator of the Black Beetle was reared in the laboratory.

4. A field experiment was initiated to test the effects of defoliation by pests on yields of coconut.

5. Field experiments were laid out to assess the efficiency of a trap designed to collect the Red Weevil, *Rhyncophorus ferrugineus* F.

6. Irradiation experiments on the Red Weevil were initiated.

7. A field trial was laid out to determine the effect of placing fungicide bags on palms as a prophylatic measure in the control of Bud Rot.

8. Investigations on the relationships between palms affected by Leaf Scorch and soil physical factors have given promising results. Significant relationships were obtained between Leaf Scorch decline and the depth at which the hard pan occurs in lateritic soils and the depth of the water table in "deniya soils". A field trial is being laid out to confirm these findings.

The information available suggests that Leaf Scorch may be a complex disorder of coconut caused by a variety of factors.

VI. BIOMETRY

Statistical Work

1. The statistical work for the Research Divisions was attended to.

2. A good portion of the working time of the division during the year was spent on collecting statistics of fertilizer usage and making summary tabulations. These assignments that came in a series prevented any research work being done.

3. Three village surveys, wherein the Advisory Division collected information on coconut cultivation were analysed and reports were prepared for circulation.

2. RESEARCH

1. Crop Forecasting Project

Work on this project continued and attempts were made to generalise the approach to crop forecasting using rainfall data. But this work was drastically curtailed as the collection of fertilizer statistics and the analysis of surveys took up all the time available after attending to the essential routine duties of the division.

2. Calibration Trial

The recordings of the calibration trial at Ratmalagara Estate were maintained as per schedule.

3. Agri-Meteorology

The Meteorological stations at Bandirippuwa Estate, Ratmalagara Estate and Isolated Seed Garden were maintained satisfactorily.

4. General

1. The Biometrician acted as Consultant Biometrician of the Rubber Research Institute of Ceylon from July 1969.

2. The Biometrician organized a training class in coconut cultivation for the Investigators in the All Island Coconut Survey now being conducted by the Department of Census and Statistics.

VII. ADVISORY DIVISION

1. Advisory Visits

(*a*) During the year 1,420 visits have been made by the Field Staff to coconut lands for advice and demonstrations on planting, soil conservation, draining, manuring, cultivation, pests and diseases control and for Fertilizer Subsidy Inspections.

(*b*) 15,286 holdings in all were visited in connection with general advisory work. 2,019 holdings were visited for advice and demonstrations in connections with pests and diseases.

(*c*) The field staff delivered 120 talks at 134 meetings attended in their ranges.

The Division participated in 2 National District Exhibitions held in Galle and Kegalle and 3 Agricultural Exhibitions held in Kandy, Matara and Marawila.

2. Demonstrations Centres

All routine items of work were carried out at the Demonstration Centres at Pallai, Alampil, Mundel and Mylambavelly.

3. Citronella Subsidy Scheme

The inspection of lands for the payment of cash subsidy and the issue of free fertilizer comprised the main items of work for the year under this Scheme. Fertilizer was distributed to applicants who had obtained their initial allocations of seedlings during the May/June and October/November 1962 planting seasons. The particulars regarding fertilizer issues during the year were as follows:—

Number of applicants to whom permits were issued	..	2,060
Number of applicants who took delivery of fertilizer	..	1,876

Amount of fertilizer distributed—514 Tons, 6 Cwts., 42 lbs.

4. Miscellaneous Work

(i) *Cyclone Relief*—Work in connection with the Cyclone Relief Scheme, which commenced in December 1968 was continued during 1969 with intermittent breaks. The Advisory Field Staff was deployed for the inspections and the issues of free seedlings and *fertilizer* under this scheme. After the inspection, of 1,265 holdings, 78,072 seedlings and 270 tons. 8 cwts. 04 lbs. of free fertilizer were issued. Whilst the cash subsidy of Rs. 1/50 was paid only in respect of 15,835 seedlings, 60,570 seedlings issued under the Scheme qualified for free fertilizer.

(ii) *Village Surveys*—The Field Staff of the Division was engaged in a detailed holding to holding survey of three villages (viz. Wennappuwa, Thoduwawa and Panirendawa) in the Chilaw District, that were affected by the Cyclone of 1967. These surveys were spread out over the period 17th April until 24th October 1969.

VIII. PLANTING DIVISION

1. *Seed Nuts.*—The Planting Division maintained 14 nurseries during the year. A total of 2,496,439 seednuts were planted for issue of seedlings in the May/June and October/November seasons. 550,775 seednuts were planted for issue of seedlings in May/June and 1,945,664 seednuts for October/November.

2. *Seedlings*—A total of 1,453,608 seedlings were booked for the two planting seasons as follows:—

	Number
May/June 1969	343,081
October/November 1969	1,110,527
	1,453,608

In addition to the above, 18,551 balance seedlings from the October/November 1968 season were also issued during the early part of the year.

IX. PUBLICATIONS UNIT AND LIBRARY

1. Journals

The following issues of the CRI Journals were published during the year:—

(*a*) *Ceylon Coconut Quarterly*

Vol. XIX, No. 4.

Vol. XX, No. 1/2. Numbers 3 and 4 were sent to the Press.

(*b*) *Ceylon Coconut Planters' Review*

Vol. V, No. 4.

Vol. VI, No. 1 was sent to the Press.

(*c*) *Pol Pawath*

Vol. IV, No. 3 was sent to the Press.

2. Advisory Leaflets

Wherever necessary, the CRI Leaflets were revised and/or reprinted in order to up-date the information and to maintain the stock position.

3. Library Bulletin

Four issues at quarterly intervals of the Library Bulletin, compiled (in mimeo. form) by the Library Assistant, were produced during the year.

4. Nineteen talks in Sinhala and nine talks in Tamil were broadcast during the year. The duration of each talk was 15 minutes. There was a repeat broadcast of each of the talks in Tamil.

W. R. N. NATHANAEL,
Director.

Ceylon Cocon. Quart. 1970 21, 13-21.

REPORT OF THE OFFICER-IN-CHARGE CHEMISTRY DIVISION (1969)

I. ARRACK

Twelve palms were continued to be tapped for sweet toddy. The samples collected were used for laboratory studies on fermentation efficiencies and the preparation of experimental samples of arrack ("high wines").

The method adopted in collecting the sap was in accordance with method (STV). In this method of tapping, the collecting vessels were washed and cleaned out, allowed to drain and then the inside flame sterilized. After flame sterilization, a small quantity of powdered 'Hal Bark' (*Vateria acuminata*) was placed in the pots before they were attached to the spathes.

The summarised data obtained on 160 samples of sweet toddy (STV) and the "High Wines" distilled therefrom are presented in Table I. The results are tabulated for 5-day sample averages.

II. GERMINATION EXPERIMENT

Studies on the uptake and distribution of macro-nutrients during the germination and progressive growth stages of the coconut that have been in progress for some years were concluded during the year 1968. The concluding analyses and observations made on the productive phase of a single palm, at the end of the 8th year of the experiment are presented.

The single palm at this stage had a well developed crown consisting of 20 leaves and 13 inflorescences. Drupes were left out when samples were taken for the analysis of the inflorescence.

Complete analyses for macro-nutrients were made on representative samples from the various components of the palm and the overall summary of the experimental results are tabulated in Tables II and III.

It would be observed that 90% or more of the nutrients are distributed in the stem and crown and less than 10% in the roots. The results indicate that the nutrients N, K and Ca are more or less evenly distributed in the stem and crown whereas there is a comparatively greater concentration of P and Mg in the stem.

The leaves were analysed separately for Rachis and Lamina and the results show that whilst there is a greater concentration of N, (30%) in the Lamina the bulk of the P, K and Ca is concentrated in the rachis.

All 20 leaves and 13 inflorescences were analysed separately and a detailed report will be published later.

TABLE I

Analysis of sweet toddy and high wines (stv)—one fifth original collected as high wines—(Each sample is an average of five days collection

M—Morning
E—Evening

Sample	TOTAL SOLIDS %			ACIDITY %					DISTILLATION			
	Col'tion Day	First Day	Second Day	Collection Day		First Day		Second Day	Volume of Toddy Distilled in mls.	Volume of Arrack Collected in mls.	Specific Gravity	% Alcohol by Volume
	M	M	M	M	E	M	E	M				
1	17.73	5.09	4.33	0.13	0.23	0.28	0.31	0.33	4000	800	0.958	35.6
2	16.97	10.07	8.26	0.14	0.19	0.24	0.25	0.26	4000	800	0.975	20.6
3	16.77	8.39	6.80	0.18	0.21	0.30	0.33	0.30	4000	800	0.966	25.8
4	16.88	7.37	6.39	0.12	0.18	0.27	0.27	0.30	4000	800	0.964	29.4
5	18.29	7.20	6.07	0.11	0.19	0.38	0.41	0.44	2720	544	0.959	34.4
6	17.92	7.61	7.14	0.14	0.21	0.29	0.29	0.32	3200	640	0.965	28.2
7	18.27	6.56	5.20	0.15	0.24	0.33	0.35	0.37	3220	644	0.959	34.6
8	17.97	6.50	4.96	0.14	0.17	0.18	0.19	0.20	3175	635	0.963	31.2
9	16.61	6.85	4.47	0.17	0.21	0.24	0.25	0.26	3200	640	0.963	31.0
10	17.28	6.84	4.95	0.13	0.21	0.34	0.36	0.39	4000	800	0.953	38.2
11	17.73	6.71	5.13	0.14	0.22	0.33	0.39	0.42	3670	634	0.948	40.2
12	17.31	6.53	4.41	0.28	0.40	0.48	0.52	0.55	2300	460	0.953	38.4
13	17.17	6.51	5.32	0.20	0.24	0.42	0.51	0.60	3360	672	0.951	38.0
14	16.95	9.72	6.92	0.20	0.21	0.24	0.28	0.29	2800	560	0.959	32.8
15	16.54	7.71	5.47	0.19	0.24	0.33	0.31	0.31	4000	800	0.955	38.0
16	16.26	8.83	6.92	0.19	0.18	0.19	0.22	0.24	3650	730	0.961	31.6
17	17.99	11.03	8.09	0.16	0.19	0.22	0.25	0.25	4000	800	0.962	29.8
18	17.14	11.04	7.82	0.16	0.20	0.23	0.23	0.26	4000	800	0.962	30.4
19	17.82	8.56	6.91	0.24	0.31	0.51	0.55	0.64	3560	712	0.960	33.0
20	17.00	7.98	5.86	0.33	0.50	0.76	0.84	0.97	3800	760	0.954	36.8
21	18.88	8.34	5.31	0.21	0.38	0.60	0.65	0.70	3540	708	0.950	40.0
22	16.76	6.41	4.19	0.27	0.40	0.54	0.61	0.63	3600	720	0.946	42.6
23	17.36	6.66	5.06	0.34	0.52	0.64	0.67	0.71	4000	800	0.949	40.6
24	17.59	7.06	5.21	0.34	0.48	0.65	0.68	0.72	4000	800	0.949	40.8
25	18.52	7.82	5.80	0.31	0.53	0.72	0.76	0.86	4000	800	0.952	38.8
26	16.78	6.04	4.90	0.41	0.61	0.80	0.83	0.43	3850	770	0.952	38.4
27	17.48	6.29	4.53	0.18	0.33	0.59	0.63	0.69	4000	800	0.955	36.4
28	16.06	6.38	4.49	0.35	0.51	0.64	0.70	0.75	3120	624	0.953	38.0
29	16.96	6.83	5.17	0.30	0.52	0.71	0.74	0.79	4000	800	0.953	37.6
30	16.14	6.77	5.44	0.34	0.62	0.76	0.80	0.91	3600	720	0.955	37.2
31	17.39	5.56	3.23	0.27	0.43	0.59	0.61	0.66	3550	710	0.953	38.2
32	14.88	6.26	5.43	0.30	0.56	0.68	0.73	0.80	4000	800	0.956	36.2
Overall Average	17.23	7.42	5.63	0.22	0.33	0.45	0.49	0.51	3622	724	0.957	35.08

TABLE II

DISTRIBUTION of the Dry matter and the Nutrients, in the various Components of the palm
(Weight in Grammes)

1	2	3	4	5	6	7	8	9	10
Component	*Root*	*Stem*	*Composite Leaves*	*Leaves*		*Leaves (Rachis + Lamina)*	*Inflore-scene*	*Crown (Composite Leaves + Leaves Inflorescene)*	*Whole Palm*
				Rachis	*Lamina*				
Dry Matter	12686.8	65738.0	6453.0	29840.4	22423.7	52264.1	4596.6	63313.7	141739
Nitrogen (as N)	55.4	570.1	60.1	104.4	333.2	437.6	33.0	530.7	1096
Phosphorus (as P)	11.0	166.3	8.2	50.0	28.5	78.5	5.4	92.1	269
Potassium (as K)	136.9	1404.7	163.3	789.6	312.5	1102.1	104.8	1370.2	2912
Calcium (as Ca)	14.1	197.2	14.9	103.3	70.8	174.1	13.2	202.2	414
Magnesium (as Mg)	29.4	147.3	19.1	54.7	48.0	102.7	14.1	135.9	313
Ash (Sulphated)	524.0	7188.5	476.9	267.6	131.2	398.8	372.8	1248.5	8961
NUTRIENTS in the Components as a percentage of the DRY MATTER									
Nitrogen (as N)	0.44	0.78	0.93	0.35	1.49	0.84	0.72	0.84	0.77
Phosphorus (as P)	0.09	0.25	0.13	0.17	0.13	0.15	0.12	0.15	0.19
Potassium (as K)	1.08	2.14	2.53	2.65	1.39	2.11	2.28	2.16	2.05
Calcium (as Ca)	0.11	0.30	0.23	0.35	0.32	0.33	0.29	0.32	0.29
Magnesium (as Mg)	0.23	0.22	0.30	0.18	0.21	0.20	0.31	0.21	0.22
Ash (Sulphated)	4.13	10.94	7.39	0.90	0.59	0.76	0.81	1.97	6.32
NUTRIENTS in the Components as percentage of Nutrients in the Palm									
Nitrogen (as N)	5.1	46.5	5.5	9.5	30.4	39.9	3.0	48.4	100.0
Phosphorus (as P)	4.1	61.7	3.1	18.6	10.5	29.1	2.0	34.2	100.0
Potassium (as K)	4.7	48.2	5.6	27.1	10.7	37.8	3.7	47.1	100.0
Calcium (as Ca)	3.4	47.7	3.6	25.0	17.1	42.1	3.2	48.9	100.0
Magnesium (as Mg)	9.4	47.1	6.1	17.5	15.4	32.9	4.5	43.5	100.0
Ash (Sulphated)	5.8	80.2	5.3	3.0	1.5	4.5	4.2	14.0	100.0

TABLE III

Macronutrients in the Palm

NUTRIENT		*Grammes per palm*
Ash (Sulphated)		8961
Nitrogen (as N)		1096
Phosphorus	(as P	269
	(as P_2O_5	616
Potassium	(as K	2912
	(as K_2O	3508
Calcium	(as Ca	413
	(as CaO	579
Magnesium	(as Mg	313
	(as MgO	518

III. POT CULTURE EXPERIMENT

(*a*) A preliminary experiment was laid down in July 1969, to observe the germination and growth performance of 30 seednuts*, selected at random and planted directly in Mitscherlich pots after seasoning in the heap, avoiding the nursery phase. (*Husked nuts with tuft were planted).

The pick was done on 17th April 1969 (2nd pick), and the seednuts were left in the heap till the time of planting i.e. 77 days. All the seednuts had germinated to the 'crow's beak' stage with the initial roots just emerging.

The average weight of the whole nuts used was 1079 grammes ranging from 767-1368 grammes.

Leaf counts were commenced from the time of their initiation and records are being kept.

(*b*) A further 10 seednuts were also planted in Mitscherlich pots from the same pick as in (*a*) above, but in these the plumule had just emerged out of the eye, and all the ten husked nuts were planted without the tuft. Eight out of the ten seednuts germinated successfully. Records and observations are being made.

(*c*) 3000 seednuts were laid down in the nursery on 3rd August 1969 to select seednuts for the 9th Sand Pot Culture Experiment.

The nineth sand pot-culture experiment on 288 seedlings was laid down on 23rd October 1969, to study the pattern of micronutrient distribution in the various components of the seedling for eight treatments (+ ALL, − ALL, − N, − P, − K, − Ca, − Mg and − TE).

The average weight of the husked nuts planted was 662 grammes ranging from 562-762 grammes.

(*d*) Studies on 'Disc Sampling' for micronutrient work

Materials for this study were obtained from the first and sixth fully-opened leaves of 3 plants from pot No. 4. These plants were 1½ years of age and had been treated throughout with the 'plus all' nutrient solution. In each frond 10 leaflets from either side were removed from the

mid region. In each leaflet, the midribs (ekel) were removed and approximately 6 inch lengths were cut off from either end. These were next briskly washed in 0.1 N HCl solution containing teepol (0.1%) and rinsed twice in deionised water before drying between filter papers. In place of discs, V-shaped pieces were cut off from the laminae and bulked for analysis. The rest of the laminae were bulked as the gross leaf sample. Both groups of samples were dried and crushed by hand before sub-samples were taken for analysis.

Iron and manganese were determined in a single plant extract by the O-phenanthroline and periodate methods respectively. The results are tabulated in Table IV.

TABLE IV

Iron and Manganese Contents in Entire Leaf Samples and Disc Samples

Sample	*Iron*	*Manganese*
	μg Fe/gram	*μg.Mn/grm*
S_1 Leaf No. 1 — entire	50.00	38.0
—do— — disc	52.00	43.0
S_1 Leaf No. 6 — entire	160.00	54.0
—do— — disc	170.00	58.0
S_2 Leaf No. 1 — entire	83.00	52.0
—do— — disc	86.25	48.0
S_2 Leaf No. 6 — entire	77.00	74.0
—do— — disc	76.00	68.0
S_3 Leaf No. 1 — entire	53.50	52.0
—do— — disc	59.00	56.0
S_3 Leaf No. 6 — entire	82.25	63.0
—do— — disc	86.25	68.0

Fully concordant results have not been obtained for the two sets of samples since all samples were hand-crushed. A major contribution to differences would be the variation in sub-samples. The results however are not discouraging and it should not be difficult to obtain differences within 5% if the samples are powdered and mixed thoroughly.

(e) Micronutrient studies on coconut seedlings grown in subtractive Sand Culture

The work reported here constitutes some preliminary studies for the proposed investigation on the relative concentrations of micronutrients in the leaves of coconut seedlings grown in subtractive sand culture. The study has been limited to the determination of iron, manganese and boron.

(i) *Nutrient contents of seednuts*

The kernels and nut water of 5 seednuts were analysed separately for the total contents of iron, manganese and boron. The data are tabulated in Tables V and VI.

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TABLE V

The Total Content of Iron, Manganese, and Boron in the Nut water of Coconut Seednuts

Sample	*Vol. of Nut Water (ml.)*	*Total Fe in μg.*	*Total Mn in μg.*	*Total B in μg.*
1	171	56.40	1142.2	140.9
2	161	45.10	1371.8	130.7
3	192	41.30	1355.6	187.4
4	185	51.80	865.8	117.7
5	83	255.65	850.0	54.8

TABLE VI

The Total Content of Iron, Manganese and Boron in the Kernel of Coconut Seed Nuts

Sample	*Wt. of Kernel*	*Total Fe. in μg*	*Total Mn in μg*	*Total B in μg.*
1	419.1	7020.0	3268.0	301.8
2	362.8	8635.0	5006.6	486.2
3	470.0	9776.0	6439.0	244.4
4	483.4	8266.0	3770.6	251.4
5	340.7	4838.0	4156.6	177.2

The results indicate that the contents of iron, manganese and boron in nuts vary considerably in both the kernel and nut water. But it is apparent that the major portion of the stored iron, manganese and boron are lodged in the kernel and not in the nut water.

(ii) *Nutrient content in the 'Crow's Beak' stage*

The shoots, roots, cotyledons, nutwater and residual endosperm (kernel) of 22 seedlings in the crow's beak stage were analysed for iron, manganese and boron. The mean values per seedling (in μg) are tabulated in Table VII.

TABLE VII

	Shoots	*Roots*	*Cotyledons*	*Kernel*	*Nutwater*
Iron ..	155.0	15.50	460.7	640.9	335.5
Manganese ..	56.2	2.20	1653.1	3546.2	629.5
Boron ...	146.0	0.14	119.2	295.5	21.2

TABLE VIII

BANDIRIPPUWA ESTATE

Set No. and Date	*No.* 3/30.12.68			*No.* 4/1.3.69			*No.* 5/22.4.69			*No.* 6/19.6.69			*No.* 7/8.8.69		
Name of Variety	% *Moisture*	% *Oil (Wet)*	% *Oil (dry)*	% *Moisture*	% *Oil (Wet)*	% *Oil (Dry)*	% *Moisture*	% *Oil (Wet)*	% *Oil (Dry)*	% *Moisture*	% *Oil (Wet)*	% *Oil (Dry)*	% *Moisture*	% *Oil (Wet)*	% *Oil (Dry)*
Bodiri (1)*	6.08	63.89	67.89	5.90	66.69	70.87	—	—	—	—	—	—	—	—	—
Bodiri (2)†	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dwarf Green (1)	5.01	67.81	71.37	4.57	69.47	72.78	4.25	68.62	71.67	5.05	67.39	70.99	4.60	65.19	68.34
Dwarf Green (2)	—	—	—	—	—	—	—	—	—	—	—	—	6.56	65.63	70.24
Dwarf Red (1)	5.77	65.65	69.67	5.70	66.12	70.12	5.61	62.90	66.64	5.58	64.18	67.99	6.38	63.45	67.76
Dwarf Red (2)	—	—	—	5.24	65.47	69.08	4.45	68.45	71.64	5.35	63.69	67.30	6.35	63.65	67.87
Dwarf Yellow (1)	5.80	64.72	68.71	4.84	65.90	69.25	4.68	64.50	67.96	5.04	67.02	70.59	5.84	68.36	72.61
Dwarf Yellow (2)	—	—	—	5.03	66.65	70.23	4.38	67.46	70.56	5.03	67.28	70.82	—	—	—
Gon Thembili (1)	5.41	66.17	69.96	5.41	67.62	71.49	4.91	67.89	71.40	5.33	65.70	69.41	6.61	65.04	69.65
Gon Thembili (2)	—	—	—	6.77	65.37	70.12	4.73	64.92	68.65	—	—	—	5.71	67.34	71.41
Kamandala (1)	5.35	66.53	70.28	5.16	65.55	69.07	4.91	65.31	68.69	5.36	65.55	69.26	7.03	64.13	69.95
Kamandala (2)	—	—	—	5.18	66.50	70.14	7.23	64.66	69.74	5.28	67.10	70.85	5.61	67.05	71.05
Navasi (1)	4.97	67.21	70.72	5.26	67.39	71.13	4.27	68.65	71.72	—	—	—	6.58	65.84	70.48
Navasi (2)	—	—	—	—	—	—	3.68	69.99	72.65	—	—	—	5.45	65.82	69.67
Ord. King Coconut (1)	7.12	64.50	69.43	5.65	65.65	69.58	4.52	65.92	69.05	5.58	65.66	68.58	5.23	65.29	68.91
Ord. King Coconut (2)	—	—	—	—	—	—	5.41	65.10	68.68	5.33	67.15	70.93	4.58	67.22	70.45
Navasi Thembili (1)	6.16	63.73	67.91	5.16	65.52	69.08	4.19	66.92	69.86	5.01	68.87	72.41	5.48	66.67	70.54
Navasi Thembili (2)	—	—	—	5.54	65.04	68.85	5.57	63.87	67.64	—	—	—	5.60	65.96	69.87
Ran Thembili (1)	6.37	64.25	68.61	5.21	66.95	70.63	4.40	66.93	69.60	5.84	66.17	70.29	5.83	67.00	71.16
Ran Thembili (2)	—	—	—	—	—	—	5.14	62.40	65.73	5.21	66.84	70.53	5.38	66.82	70.63
Typica (1)	5.51	65.80	69.80	—	—	—	4.66	68.01	71.33	4.89	67.68	71.17	6.79	65.61	70.40
Typica (2)	—	—	—	—	—	—	4.06	69.00	71.92	—	—	—	6.84	65.21	70.01

RATMALAGARA ESTATE

	No. 3/ 21.1.69			*No.* 4/1.3.69			*No.* 5/30.5.69			*No.* 6/6.10.69		
Dwarf Green	4.94	67.68	71.23	4.23	67.83	70.83	4.13	69.20	72.23	5.98	65.70	69.89
Dwarf Red	6.07	65.03	69.23	5.07	63.41	66.79	5.11	64.41	67.90	6.05	62.02	66.02
Dwarf Yellow	5.45	65.83	69.62	4.96	64.91	68.29	5.05	64.79	68.24	6.07	62.04	66.05
Natural Hybrid	5.16	67.50	71.18	4.52	66.47	69.62	5.05	66.57	70.12	5.42	66.11	69.90

*Number One Copra
†Number Two Copra

TABLE IX

Composition of Fresh Coconut Milk, Concentrated Coconut Cream and Creamed Coconut

Constituent	*COCONUT MILK**		*CONCENTRATED COCONUT CREAM†*	*CREAMED COCONUT§*		*FIGURES CALCULATED ON MOISTURE FREE BASIS*		
	Obtained by Hydraulic Pressing (Approximate Av. composition)%	*Calculated to 15.8% moisture*	*As marketed Per cent*	*Sample received for Lab. examination*	*Calculated to 15.8% moisture*	*Coconut Milk Per cent*	*Coconut Cream Per cent*	*Creamed Coconut Per cent*
Moisture	50.0	15.8	15.8	52.8	15.8	0.0	0.0	0.0
Oil	40.0	67.3	45.8	38.7	69.0	80.0	54.4	81.9
Proteins	3.0	5.1	6.0	2.1	3.7	6.0	7.1	4.4
Minerals	1.5	2.5	7.0	0.6	1.1	3.0	8.3	1.3
Sugars	3.0	5.1	7.0	3.5	6.2	6.0	8.3	7.4
Other Solids	2.5	4.2	18.4	2.3	4.2	5.0	21.9	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Solids	10.0	16.9	38.4	8.5	15.1	20.0	45.6	18.1

*Emulsion obtained from grated coconut meat by manual pressing.
†Market specimen.
§Sample received for laboratory examination.

IV. COCONUT VARIETIES GROWN IN CEYLON

Samples of copra prepared by the Division of Botany from Coconut varieties grown in Ceylon were examined and reported on for oil content. The results are tabulated in Table VIII.

V. MISCELLANEOUS WORK

(i) Samples of coconut cream, and creamed coconut milk, were analysed and the results are Tabulated in Table IX. The results of analysis of a typical sample of coconut milk (emulsion obtained from grated coconut meat by manual pressing) is included in the results for comparative purposes.

(ii) Eight samples of Coconut Refuse were analysed for moisture, oil and free fatty acids and the results are tabulated in Table X. The results show that there is a large variation in the F.F.A. contents of the samples depending probably on the duration of storage and concomitant microbiological deterioration.

TABLE X

Moisture, Oil Content and Free Fatty Acids on Coconut Refuse

1 *Sample*	2 % *Moisture*	3 % *Oil* (*Wet basis*)	4 % *Oil* (*Dry basis*)	5 % *F.F.A.*
I	7.37	46.16	49.84	13.21
II	7.18	46.31	49.90	14.13
III	8.23	40.25	43.89	7.60
IV	8.65	35.03	38.35	18.76
V	9.02	36.34	39.95	11.45
VI	9.06	32.11	35.32	27.29
VII	11.67	27.50	31.13	27.24
VIII	10.35	31.95	35.63	23.22
MEAN	8.94	36.96	40.50	17.86
C.V.%	15.6	17.2	15.9	39.0

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Ceylon Cocon. Quart. (1970) **21**, 22-24.

REPORT OF THE BOTANIST (1969)

A. BREEDING AND SELECTION

1. Controlled Pollination Work

The production of high-yielding planting material was carried out at Bandirippuwa, Ratmalagara, Marandawila, Achchitotam, Andigedera and Kiniyama estates, as well as the Coconut Seed Garden, Ambakelle. Two types of crosses were done: (1) *Typica* × *typica* where the male parent is a prepotent and (2) *typica* × *pumila* where phenotypically superior *typica* palms are crossed with dwarf pollen collected from palms which have flowered in a short period (30-36 months from date of transplanting). 171,254 female flowers were pollinated consisting of 112,729 *typica* × *typica* and 58,525 *typica* × *pumila*. Systematic emasculation of selected *pumila palms* within the isolated seed garden, Ambakelle (see Annual Report of the Botanist 1964), yields *pumila* × *typica* seednuts through natural cross-pollination.

23,608 *typica* × *typica*, 14,518 *typica* × *pumila* and 10,152 *pumila* × *typica* seednuts were harvested during the year from crosses done in 1968.

The demand for hand-pollinated seedlings continues to be very high. During the period under review 21,400 hand-pollinated seedlings were issued as summarised below.

Planting season	*typica* × *typica*	*typica* × *pumila*	*pumila* × *typica*
May/June	5029	325	4984
October/November	4902	1580	4581
	9931	1905	9565

The private sector is being assisted to carry out their own programmes of controlled pollination, and during the period under review, besides technical advice, 352 samples of *typica* (prepotent) pollen and 509 samples of *pumila* pollen have been issued to them, from the pollen bank.

2. Inter-varietal crosses

The earliest crosses were done in 1950, and the F_1 progeny planted at the Ratmalagara Research Station. The performance of *typica* × *pumila* and *pumila* × *typica* F_1 hybrids has been reported in previous annual reports, and at the age of 19 years the yields are very satisfactory as indicated below:—

Cross	*No. of palms*	*Total yield* (1969) *nuts*	*wt. of husked nuts* (*lb.*)	*Mean yield* (*nuts*)	*Husked nut weight* (*lb.*)
Typica × *pumila*	18	2897	4489.68	161	1.55
Pumila × *typica*	5	765	1221.10	153	1.60
Typica × *typica*	35	3734	5299.69	107	1.41

The performance of these hybrids has been properly assessed only in the Chilaw District. Since 1960, *typica* × *pumila* and *pumila* × *typica* F_1 hybrids have been planted fairly extensively in the major coconut growing districts. A survey was commenced this year to evaluate the performance of these hybrids when grown under different conditions of management in a range of soil types. It is hoped to complete this survey in 1970.

B. MOTHER PALM SEED SELECTION SCHEME

This year the Planting Division nurseries were supplied with 2,092,753 selected seed-nuts from mother palms. Further selection of mother palms had to be curtailed due to drought which affected both the size and number of nuts. As a consequence only 1,900 additional mother palms were selected from Letchemey and Walahapitiya estates, Natandiya, in the Chilaw District.

The mother palm seed selection scheme was commenced in 1960. A decline in yield, (number and size of nuts) has been noticed on some of the selected palms. This may be expected as the selections were based on phenotypic characters. It is proposed to re-select the palms during the course of next year.

3. PROGENY TRIALS

The progeny trials at Marandawila, Walpita and Bandirippuwa were maintained during the year. The Bandirippuwa Progeny Trial planted in 1959 tests the un-selected progenies of 125 selected high-yielding palms. This experiment was laid down as an underplantation, and although the palms are eleven years old their growth is slow with only 78 per cent in flower and 47 per cent in bearing. Another five to six years may have to elapse before the yield data could be analysed.

The purpose of these progeny trials is the identification of palms of high-breeding value, and the need for experimental techniques which shorten the period taken for identification is generally recognised. The Pothukulama Progeny Trial (Annual Report of the Botanist, 1966) tests the open-pollinated progeny of 248 selected palms from the Isolated Seed Garden, Ambakelle. The progeny was planted 13 ′×13 ′ on the square system. Here an attempt is being made to use the leaf production of the progeny as an index of the breeding value of parents. Leaf counts have been taken in December (36 months from date of transplanting), and the plantation will be thinned out to give a more conventional 26 ′ × 26 ′ stand.

4. Isolated Seed Garden, Ambakelle

Twenty-thousand teak seedlings were planted in the Western isolation barrier recently freed of "squatters", and an establishment rate of about 70 per cent may be expected. Fifty to seventy-five acres remain for re-afforestation. Effects of drought on the coconut plantation have been severe, particularly in field No. 1 planted in 1955.

C. VARIETIES AND FORMS OF THE COCONUT

A coconut varieties block was established in May 1960. A simple observation trial was initiated in 1967 and the following characters noted:—(1) duration of male phase, (2) duration of female phase (3) percentage setting of female flowers (4) incidence of immature nut-fall (5) yield of nuts and copra and (6) oil content. The collection of data was completed in December this year.

D. FIELD EXPERIMENTS

Field experiments and observation trials at Bandirippuwa (13) Ratmalagara (5), Walpita (1) and Pothukulama (9) were maintained throughout the year.

A field trial was laid at Bandirippuwa to compare the performance of *typica* × *pumila* (hand-pollinated) and *pumila* × *typica* natural cross hybrids.

E. PERSONNEL

Dr. M. A. P. Manthriratne, Research Assistant, resumed duties after completion of post-graduate studies at the Welsh Plant Breeding Station, Aberystwyth, U.K. He was appointed Botanist with effect from 22nd October, 1969, relieving Mr. R. B. Rodrigo, Field Officer, who functioned as Officer-in-Charge for the period December 1966 to October 1969.

Messrs. W. Hugo Fernando and K. P. Anthony Fernando were appointed as Field Attendants (pollination) with effect from 1st August, 1969.

M. A. P. MANTHRIRATNE,
Botanist.

Ceylon Cocon. Quart. (1970) 21, 25-39.

REPORT OF THE ACTING SOIL CHEMIST (1969)

SUMMARY

A. FIELD EXPERIMENTS

The long term experiments at Bandirippuwa, Ratmalagara, Bingiriya, Pothukulama, Walahapitiya, Mawatte, Naiwala and Rathgama were maintained. The observation trials at Kirimetiya, Iranaville and Palugaswetiya were continued.

The main effect of potassium was significant at Bandirippuwa, Ratmalagara, Pothukulama and Naiwala. The main effect of phosphorus was significant at Bandirippuwa and Ratmalagara as well. NK interaction at Bandirippuwa and NP, PK interactions at Ratmalagara were significant.

B. LABORATORY INVESTIGATIONS

Results of the analysis of leaf samples taken from the experiments at Marandawila and Monrovia Estates and the results of the radioisotope experiment at Mawatte Estate are given.

C. SOIL SURVEYS

The regional soil survey of the coconut growing areas of the Eastern Province was completed. Detailed soil survey of areas, in the Ambalangoda and Galle 1″ sheets, affected by "Leaf Scorch Decline" was commenced.

DETAILED REPORT

A. FIELD EXPERIMENTS

1. 4×4×4 NPK Experiment on Adult Palms—Bandirippuwa Estate (commenced November 1960)

The annual manuring was carried out in November 1969 and the entire experimental area was ploughed.

Both potash and phosphorus gave significant response and there was a positive NK interaction. The main effects are shown in Table A1 and the NK interaction in Table A2.

TABLE A1

Yield data for 1969—4×4×4 NPK Experiment on adult palms Bandirippuwa Estate

66 palms per acre

Copra yield adjusted by co-variance analysis

Treatment (annual)	*lb. Copra/acre*	%	*Difference lb. copra/acre*
N_0 — 0.0 lb. N	1306	100.0	—
N_1 — 0.5 lb. N	1450	111.0	144*
N_2 — 1.0 lb. N	1421	108.8	115
N_3 — 1.5 lb. N	1367	105.7	61
P_0 — 0.0 lb. P_2O_5	1227	100.0	—
P_1 — 0.5 lb. P_2O_5	1388	113.1	161*
P_2 — 1.0 lb. P_2O_5	1351	110.1	124*
P_3 — 1.5 lb. P_2O_5	1579	128.7	352**
K_0 — 0.0 lb. K_2O	1173	100.0	—
K_1 — 0.5 lb. K_2O	1370	116.8	197*
K_2 — 1.0 lb. K_2O	1488	126.9	315**
K_3 — 1.5 lb. K_2O	1513	129.0	340**

Significant difference P0.05=122.19 lbs. copra/acre.
*Significant at P0.05
**Significant at P0.01

TABLE A2

Adjusted NK interactions—lb. copra/acre

	N_0	N_1	N_2	N_3
K_0	1282	1198	1180	1032
K_1	1288	1367	1352	1471
K_2	1177	1667	1530	1579
K_3	1476	1568	1623	1385

2. 3×3×3 NPK Experiment on Young Palms—Ratmalagara Estate (commenced December 1948)

The annual manuring was carried out in November 1969. The main effects of phosphorus and potassium and NP and PK interactions were significant.

The main effects of NPK for 1969 are presented in Table A3 and the NP and PK interactions in Table A4.

TABLE A3

Yield data for 1969—3×3×3 NPK Experiment on Young Palms

52 palms/acre

Treatment annual	*lb. Copra/ Acre*	%	*Difference lb. copra/acre*	*Out-turn Nuts/candy*
N_0 (1½ lb. Ammonium Sulphate)	1936	100	—	1098
N_1 (3 lb. Ammonium Sulphate)	2023		87	1130
N_2 (4½ lb. Ammonium Sulphate)	1975		39	1175
P_0 (1 lb. Saphos Phosphate)	1714	100	—	1104
P_1 (2 lb. Saphos Phosphate)	2121		407**	1131
P_2 (3 lb. Saphos Phosphate)	2100		386**	1138
K_0 (1½ lb. Muriate of Potash)	1862	100	—	1175
K_1 (3 lb. Muriate of Potash)	1985		123	1124
K_2 (4½ lb. Muriate of Potash)	2087		225*	1108

Significant difference at P0.05=163.5 lb. copra/acre
*Significant at 0.05
**Significant at 0.01

TABLE A4

	P_0	P_1	P_2
N_0 ..	1679	2003	1946
N_1 ..	1656	2242	2169
N_2 ..	1627	2115	2182
K_0 ..	1679	1842	2064
K_1 ..	1652	2180	2122
K_2 ..	1810	2340	2116

3. 4×4×4 NPK Experiment on Young Palms—Pothukulama Research Station (commenced December 1960)

The annual manuring was done in October 1969. The yield data for the year showed that the main effect of K was significant at P0.05 level.

TABLE A5

Yield data for 1969—4×4×4 NPK Experiment on Young Palms

72 palms/acre

Treatment	*lb. copra/acre*	%	*Difference lb. copra/acre*
N_0 ..	1612	100	—
N_1 ..	1834	113.8	222
N_2 ..	1799	111.6	187
N_3 ..	1644	102.0	32
P_0 ..	1590	100	—
P_1 ..	1736	109.2	146
P_2 ..	1732	708.9	142
P_3 ..	1830	115.1	240
K_0 ..	1477	100	—
K_1 ..	1709	115.7	232*
K_2 ..	1843	124.8	366*
K_3 ..	1859	125.9	382*

4. Manurial × Cultivation Experiment—Ratmalagara Estate (commenced July 1943)

Since the reversal of the treatments in May 1965 (details in Annual Report for 1965) there are clear indications that the differences between the phosphorus treatments before the change are narrowing. In the case of the potash treatments the trend is erratic.

5. Experiment on quality of nitrogen and phosphorus and frequency of manuring—Pothukulama Research Station, Pallama (commenced June 1967)

The annual and biannual manurings were duly done in July 1969 and December 1969. Leaf counts and the height measurements, from the ground to the tip of the youngest fully opened leaf, were taken in May 1969.

In the production of leaf, the main effect of nitrogen was significant, ammonium sulphate being superior to urea. Also there was significant nitrogen × frequency of application interaction —annual application of sulphate of ammonia was better than annual supply of sodium nitrate or urea.

On its effect on growth (height) there was significant phosphorus × frequency of application interaction—half yearly application of saphos phosphate being better than half yearly manuring with super phosphate.

6. Method of placement and liming experiment on adult palms—Walahapitiya Estate, Nattandiya (commenced November 1961)

The annual manuring was carried out in November 1969. Lime, at the rate of 15 cwts. per acre, was applied to the relevant plots in May 1969.

The data for the year showed significant response to placement and level of fertilizer and a significant interaction between placement and fertilizer.

The yield data for the year 1969 are recorded in Table A6.

TABLE A6

Yield data for 1969—Experiment on placement and liming (Walahapitiya Estate)

50 palms per acre

(Yields adjusted by Co-variance Analysis)

	lb. copra/acre	%	*Difference lb. copra/acre*
O—No fertilizers	713	100	—
B—Broadcast	1125	157.8	+407***
C—Surface application up to 6 ft. from base	1170	164.1	+452***
S—Surface application in annular strips	1142	160.2	+424***

Significant difference P0.05=68.9 lb. copra/acre

***Significant at P0.001

L_0—No Lime	1030	100	—
L—Lime	1047	101.7	+17
O—No Fertilizer	713	100	—
F_1—3½ lb. NPK Mixture ..	933	130.9	+220
F_2—7 lb. NPK Mixture	1145	160.6	+432

	F_1	*F_2*
O—No fertilizer	724	713
B—Broadcast	1007	1243
C—Surface Application up to 6 ft. from base	1016	1324
S—Surface application in annular strips	985	1302

7. 5×5×5 NPK Experiment on Adult Palms—Naiwala Estate, Veyangoda (commenced July 1967)

A remarkable response to potassium has been shown, the linear response being significant at 1% level.

TABLE A7

Estimated yield data for 1969

72 palms/acre

	lb. copra/acre	%	*Difference lb. copra/acre*
N_0	1204	100.0	—
N_1	1376	114.3	172
N_2	1478	122.8	274
N_3	1511	125.5	307
N_4	1472	122.3	268
P_0	1428	100.0	—
P_1	1438	100.7	10
P_2	1428	100.0	—
P_3	1399	98.0	-29
P_4	1348	94.4	-80
K_0	1228	100.0	—
K_1	1204	98.0	-24
K_2	1294	105.4	66
K_3	1508	122.8	280
K_4	1808	147.2	580

8. Experiment on quality of nitrogen and frequency of manuring—Mawatte Estate, Dankotuwa (commenced December 1964)

No significant difference in response to the different forms of nitrogen was shown. In the case of ammonium sulphate and urea, annual manuring showed significantly superior to biannual manuring.

TABLE A8

Yield data for 1969—quality of nitrogen and frequency of manuring—Mawatta Estate

66 palms per acre

Copra Yield Adjusted by Covariance Analysis

Source of Nitrogen	*Frequency of Application*	*lb. copra per acre*	%
Control	—	1782	100.0
Ammonium Sulphate	Biannual	1866	104.7
	Annual	1969	110.5
Urea	Biannual	1841	103.3
	Annual	1957	109.8
Ammonium Nitrate	Biannual	1889	106.0
	Annual	1919	107.7
Sodium Nitrate	Biannual	1956	109.8
	Annual	1934	108.5

9. Manurial experiment on organics vs. inorganics and frequency of manuring—Marandawila Estate, Bingiriya (commenced June 1960)

The annual plots were manured in May 1969. No significant difference was shown between organic and inorganic fertilizers nor between annual and biennial manuring.

10. 5 × 5 × 5 × 5 NPK Mg Experiment on Adult Palms—Marandawila Estate, Bingiriya (commenced November 1967)

A strike at the Fertilizer Corporation of Ceylon compelled the postponement of the manuring due in November 1969. It was carried out in January 1970.

11. 5 × 5 × 5 × 5 NPK Mg Experiment on Adult Palms—Monrovia Estate, Rathgama (commenced November 1967)

The annual manuring was done in December 1969.

12. 5 × 5 ×5 BZn S Experiment on Adult Palms—Monrovia Estate, Rathgama (commenced June 1969)

The manuring due in May/June, had to be postponed, due to delay in the purchase and transport of the manure to the estate. The application was carried out in October/November. Owing to the non-availability of good labour, the burying of husks in pits has not been completed.

13. "Leaf Scorch" problem—Gonapinuwela Area

The two groups of healthy (220) and affected (220) palms were continued to be treated with the different combinations of nutrients. The recording of nuts and female flowers was maintained.

Of the original group of 220 healthy palms 5 have been lost, including one blown down by wind and one struck by lightning. During the year 21 more palms showed symptoms of scorch. The total number of palms showing signs of leaf scorch is 108.

From the original group of 220 affected palms 7 more palms died during the year, bringing the total loss todate to 41. The condition of the palms continue to deteriorate and signs of recovery are not evident.

This trial has been terminated with the end of the experimental year in October 1969.

14. Observation trials on nitrogen quality—Iranaville Estate, Chilaw

The quarterly application of the different combinations of fertilizers was duly carried out during the year. Table A9 shows the data on female flowers, nuts and copra for the pre-manurial year (1966), 1967, 1968 and 1969.

TABLE A9

Yield data per palm—Iranaville Estate, Chilaw:

Treatment	*FEMALE FLOWERS*				*NUTS*				*COPRA (lb.)*			
	Pre-manurial	1967	1968	1969	*Pre-manurial*	1967	1968	1969	*Pre-manurial*	1967	1968	1969
Control	—	—	—	104	—	—	—	38	—	—	—	16
1	9	27	90	146	7	15	31	33	3	7	13	14
2	11	26	105	136	6	16	33	31	4	7	13	12
3	10	24	65	154	14	18	33	42	6	8	14	17
4	12	36	90	170	12	20	36	40	6	8	15	17
5	11	27	117	201	11	16	41	40	5	7	16	16
6	14	23	58	275	13	15	32	46	6	7	14	17
7	14	29	87	172	7	15	27	26	4	6	11	11
8	12	47	113	208	9	13	24	24	4	5	10	11
9	15	34	84	188	9	17	33	31	4	7	14	13
10	8	30	227	164	6	11	31	19	3	4	12	8

15. Observation trial on immature nutfall—Palugaswetiya Estate, Weerapokuna

The treatments were continued during the year. It could not be said that barium or strontium induced immature nutfall. Treatment with gypsum or extra supply of muriate of potash had no minimising effect on the fall of immature nuts.

B. LABORATORY INVESTIGATIONS

1. Leaf Analysis

Leaf samples taken in October 1967, prior to the first differential manuring, from the experimental palms in the 5 × 5 × 5 × 5 NPK Mg Experiments at Marandawila and Monrovia Estates were analysed for N, P, K, Ca and Mg. The results are presented in Tables B 1 and B 2 respectively.

TABLE B1

Results of Leaf Analysis (14th Leaf)

5 × 5 × 5 × 5 NPK Mg Experiment, Marandawila Estate, Bingiriya

Plot No.	*PERCENTAGE CONTENT (OVEN DRY)*				
	Nitrogen N	*Phosphorus* P_2O_5	*Potassium* K_2O	*Calcium* Ca	*Magnesium* Mg
1	2.1456	0.3223	0.8376	0.1972	0.4008
2	2.0602	0.2958	1.0346	0.2317	0.3939
3	2.0879	0.2972	0.9116	0.2312	0.3931
4	2.0646	0.2989	0.6583	0.3637	0.3599
5	1.7870	0.3266	0.5500	0.3589	0.3740
6	2.0063	0.3153	0.8555	0.3809	0.3009
7	1.8168	0.3016	1.0484	0.4295	0.3035
8	1.8054	0.3249	0.9538	0.3524	0.3365
9	1.8536	0.3409	1.0080	0.3628	0.3020
10	1.9542	0.2856	1.5013	0.3252	0.1843
11	1.9608	0.3406	0.9374	0.2892	0.2540
12	2.0266	0.3142	1.0491	0.2714	0.2191
13	2.0371	0.3401	0.9873	0.2679	0.1833
14	2.0191	0.3573	1.1872	0.3564	0.2518
15	1.9700	0.3171	1.2904	0.3901	0.2343
16	2.0618	0.3216	1.2322	0.2399	0.2411
17	2.1047	0.2851	1.0209	0.3566	0.3032
18	1.8941	0.2447	0.8820	0.3192	0.2592
19	2.0610	0.2995	1.3505	0.2884	0.1686
20	2.0126	0.2853	0.9780	0.3022	0.2397
21	1.9164	0.3247	0.7313	0.2578	0.2126
22	2.0146	0.2067	0.7179	0.2788	0.1852
23	1.9789	0.1966	0.8084	0.2890	0.2255
24	1.9698	0.2358	1.0747	0.3075	0.2222
25	2.0238	0.2174	0.9782	0.4367	0.2216
26	2.0162	0.2360	1.1306	0.2908	0.3201
27	1.9826	0.2934	1.0041	0.2458	0.2182
28	2.0864	0.3016	1.1076	0.2561	0.2462
29	2.0686	0.3225	0.7215	0.2870	0.2934
30	2.0007	0.2995	0.8714	0.2053	0.1995
31	1.9416	0.2989	0.6631	0.2163	0.2146

TABLE B2

Results of Leaf Analysis (14th Leaf)

5 × 5 × 5 × 5 NPK Mg Experiment, Monrovia Estate, Rathgama

Plot No.	*PERCENTAGE CONTENT (OVEN DRY)*				
	Nitrogen N	*Phosphorus P_2O_5*	*Potassium K_2O*	*Calcium Ca*	*Magnesium Mg*
1	2.133	0.2619	1.4809	0.1603	0.3071
2	1.980	0.2438	1.1112	0.1415	0.3527
3	1.978	0.2422	1.2418	0.1499	0.3278
4	1.906	0.2610	1.3832	0.1315	0.3739
5	1.980	0.2216	1.4734	0.1407	0.3168
6	1.879	0.2200	1.0513	0.1583	0.3426
7	1.915	0.2864	1.4057	0.1527	0.2188
8	1.947	0.2633	1.4889	0.1611	0.2459
9	2.001	0.3022	1.0588	0.1313	0.3112
10	1.903	0.2621	1.1569	0.1508	0.3122
11	1.785	0.2731	1.1126	0.1605	0.2848
12	2.423	0.2832	1.3909	0.1699	0.2336
13	1.967	0.2812	1.2422	0.2718	0.1696
14	1.857	0.2603	1.1952	0.2903	0.1865
15	1.987	0.2802	1.1919	0.3735	0.1149
16	1.801	0.2585	1.3242	0.2883	0.1514
17	1.959	0.2786	1.4584	0.2321	0.1456
18	1.879	0.2573	1.5457	0.2499	0.1619
19	1.934	0.2695	1.5551	0.2702	0.1406
20	2.024	0.3013	1.1574	0.2640	0.1935
21	2.058	0.2816	1.1976	0.2721	0.2038
22	2.090	0.4851	1.3892	0.2452	0.1707
23	2.099	0.3013	1.5270	0.2068	0.1591
24	2.083	0.3020	1.0673	0.2646	0.2167
25	2.077	0.2608	1.7480	0.3186	0.1866
26	1.974	0.2667	1.6792	0.2853	0.1491
27	1.973	0.2610	1.7982	0.2442	0.1418
28	1.854	0.2617	1.4773	0.3103	0.1929
29	1.894	0.2624	1.4833	0.2361	0.1708
30	2.083	0.2837	1.2991	0.2930	0.1539
31	2.032	0.2617	1.3855	0.4046	0.1930

2. Radio isotope studies on efficiency of fertilizer utilization by coconut palms (in co-operation with the International Atomic Energy Agency)

The contract signed with the International Atomic Energy Agency was renewed in 1969 also. During the year two experiments were carried out on a lateritic gravelly loam soil at Mawatte Estate, Dankotuwa. The experiments were conducted in March and December 1969.

10389—4

TABLE B3
MEAN SPECIFIC ACTIVITY OF LEAF SAMPLES (6TH LEAF)
Counts per Min. Per Gramme Dry Matter

Distance of Placement	*10TH DAY SAMPLES*					*20TH DAY SAMPLES*					*30TH DAY SAMPLES*					*40TH DAY SAMPLES*				
	Cms.				*Total*	*Cms.*				*Total*	*Cms.*				*Total*	*Cms.*				*Total*
(*Metres*)	12	24	36	48		12	24	36	48		12	24	36	48		12	24	36	48	
0.5	47.2	26.7	7.8	5.7	87.4	75.4	41.8	15.0	13.5	145.7	164.1	80.3	33.4	30.7	308.5	365.7	227.1	134.9	137.8	865.5
1.0	14.1	23.4	6.5	4.4	48.4	56.8	31.6	13.3	13.5	115.2	37.0	92.3	45.8	19.7	194.8	72.9	236.9	129.3	71.0	510.1
1.5	8.5	18.0	11.3	3.2	41.0	12.9	78.9	57.0	6.8	155.6	27.7	35.7	52.9	18.5	134.8	91.5	101.6	135.2	39.1	367.4
2.0	5.2	5.4	4.3	2.6	17.5	9.5	50.4	7.5	3.0	70.4	29.9	29.8	9.7	24.7	94.1	81.6	125.2	43.6	30.6	281.0
Total	75.0	73.5	29.9	15.9	194.3	154.6	202.7	92.8	36.8	486.9	258.7	238.1	141.8	93.6	732.2	611.7	690.8	443.0	278.5	2024.0

ANALYSIS OF VARIANCE

Source		*10TH DAY*			*20TH DAY*			*30TH DAY*			*40TH DAY*		
		D.F.	*S.S.*	*M.S.*	*F.*	*S.S.*	*M.S.*	*F.*	*S.S.*	*M.S.*	*F.*	*S.S.*	*M.S.*	*F.*
Blocks		2	183.56			15231.97			7194.72			3657.30		
Distance	l	1	1766.92	1766.92	31.01***	1288.53	1288.53	0.95	18534.60	18534.60	11.47***	134881.45	134881.45	16.17***
	q	1	45.26	45.26	0.79	561.02	561.02	0.04	1001.93	1001.93	0.62	13574.41	13574.41	1.63
	c	1	86.88	86.88	1.525	1448.94	1448.94	1.07	43.10	43.10	0.003	921.20	921.20	0.11
Depth	l	1	1829.33	1829.33	32.11***	8049.26	8049.26	5.96*	13117.25	13117.25	8.12***	58337.78	58337.78	6.996*
	q	1	28.83	28.83	0.50	2037.11	2037.11	1.51	143.17	143.17	0.09	11138.61	11138.61	1.34
	c	1	192.25	192.25	3.38	1689.11	1689.11	1.25	579.39	579.39	0.36	6307.85	6307.85	0.76
Dist. × Depth		9	4062.67	451.42	7.92***	14911.11	1656.79	1.23	32464.16	3607.13	2.23	114896.60	12766.28	1.531
Error		30	1709.01	56.97		40513.06	1350.44		48478.93	1615.96		250168.48	8338.95	
Total		47	9904.70			85730.14			121557.25			593883.58		
C.V.				62.14%			120.71%			87.83%			72.19%	

The experimental layout was similar to the experiment reported in the Annual Report for 1968. The distances of placement were 0.5, 1.0, 1.5 and 2.0 metres and the depths were 12, 24, 36 and 48 cms. The placement of the radioactive phosphorus was done as in the earlier experiment.

In both experiments samples were taken from the sixth frond of each treated palm 10, 20, 30 and 40 days after the application of radioactive phosphorus, and in the second experiment on the 50th day also. In the second experiment, samples were taken from the first and thirteenth fronds on the 20th, 40th and 50th day after the application of the radioisotope.

The samples were processed and analysed as in the earlier experiments. Radioactivity on the sixth frond was used as the criterion of efficiency of uptake. The results of the first experiment at Mawatte Estate together with the analysis of variance are reported in Table B3.

The analysis of the samples from the second experiment is in progress.

Estimations of available phosphorus (Olsen's), total exchangeable bases, exchangeable calcium, magnesium, potassium, total nitrogen, total carbon, mechanical analysis, pH and moisture in soil samples associated with the radioisotope studies were also carried out. Phosphorus and potassium in the leaf samples were also determined.

Variation of uptake with distance of placement and time

Distance of Placement Metres	*MEAN COUNTS PER PALM*			
	10th Day	*20th Day*	*30th Day*	*40th Day*
0.5	21.9	36.4	77.1	216.4
1.0	12.1	28.8	48.7	127.5
1.5	10.3	38.9	33.7	91.9
2.0	4.4	17.6	23.6	70.2

For all distances of placement, the uptake increased with time, except for one instance. On all dates of sampling, the uptake decreased with a single exception, with increase in distance of placement. The highest uptake, 20th day excluded, occurred from placements distant 0.5 metres from the palm.

Variation of uptake with depth of placement and time

Depth of Placement cms.	*MEAN COUNTS PER PALM*			
	10th Day	*20th Day*	*30th Day*	*40th Day*
12	18.8	38.7	64.7	152.9
24	18.4	50.7	59.6	172.7
36	7.5	23.2	35.4	110.8
48	4.0	9.2	23.4	69.6

For all depths of placement, the uptake increased with time. It is not clear whether the uptake from deeper placements increases with time. Such a phenomenon was clearly evident in the first experiment conducted at Marandawila Estate (Annual Report for 1968). There is a noticeable drop in uptake from depths below 24 cms.

C. SOIL SURVEYS

(Report submitted by Mr. K. S. O. Perera, Technical Assistant, Soil Survey Unit.)

The regional soil survey of the Eastern Province is almost completed, with the exception of the Nilaveli 1″ sheet which was just commenced.

As stated in earlier reports the typical soils of the coconut growing areas in the region consist of the sandy Regosols, of the great coastal sandplain which is bounded in the west by a system of lagoons, and on the East by the sea. In the regions south of Kalkudah 1″ sheet the sandplain is thrown into a ridge and runnel landform, and the soils are classified in the Kalkudah, Batticaloa, Kalmunai and Tirrukovil 1″ sheets with the following phases—(A) *Kalkudah Series—Dry phase*—developed on sand ridges.

B. Kalkudah Series—Moist phases. Here the water table is at about 48″ in the higher slopes and in the very moist slopes, and in the sandy depressions, the water table is at about 24″. In the very moist phases there is pronounced yellowing and tapering of palms

Kathiraveli and Nilavelli 1″ Sheets

Here the coastal sand plain is flat, and could be differentiated into (A) Lagoon Sandplain and (B) Marine sandplain. Soils of the lagoon sandplain are imperfectly drained with the presence of calcareous nodules which can form a hardpan at 43″. Coconut palms in these soils are very poor, with pronounced yellowing, and partially desiccated collapsed fronds. However the soils of the marine sandplain are more favourable for coconut cultivation.

Sammanthurai-Koduwamadhu Complex

The soils, interior to the coastal sandplain, which are developed on Biotite gneisses, are shallow, gravelly soils, consisting of red, well drained soils as at Koduwamadhu, and yellow, imperfectly drained soils as at Sammanthurai. Coconuts are grown only in small holdings in these soils.

Detailed Soil Survey Of Areas In The *Ambalangoda-Galle* 1″ Sheet.

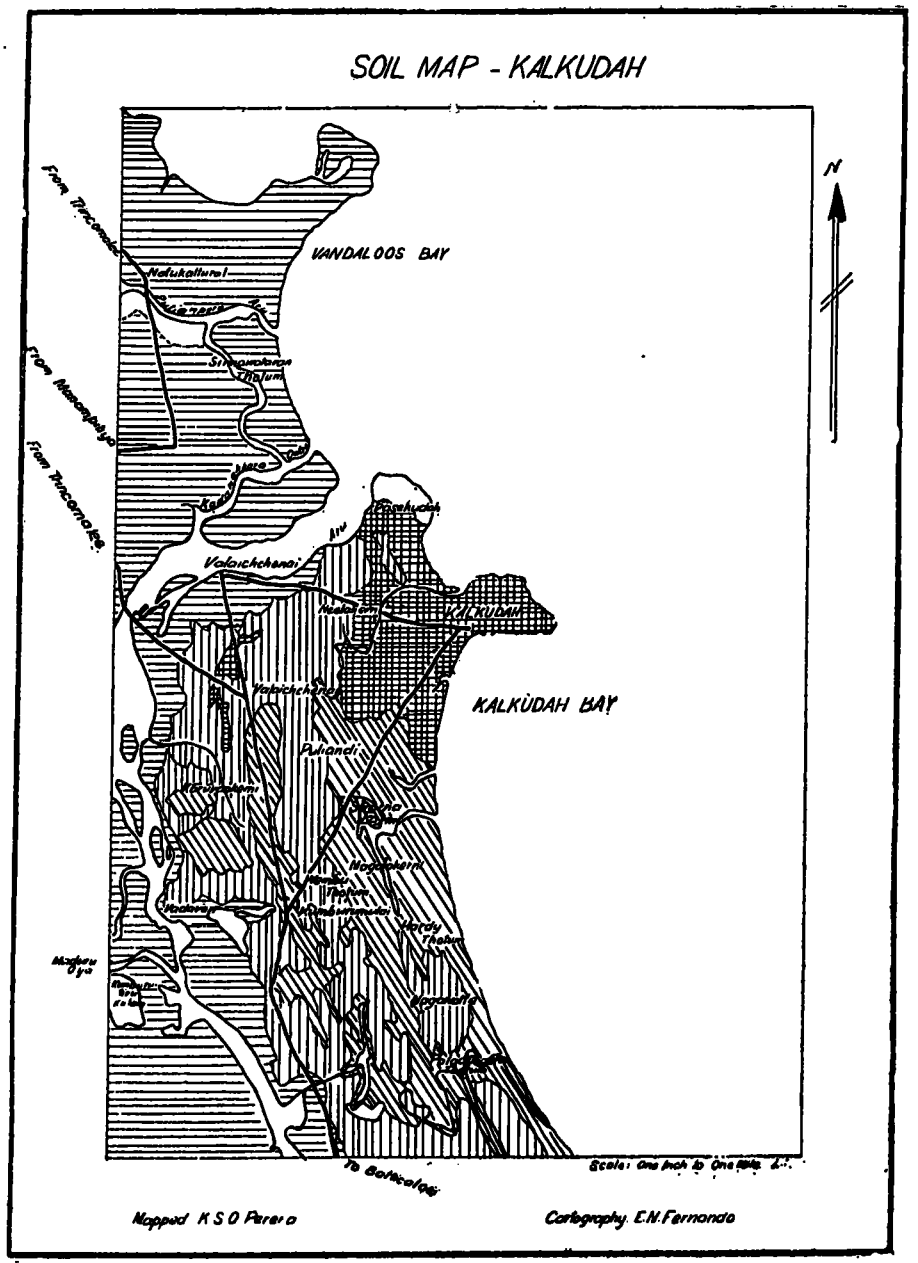
The detailed soil survey was extended to all regions in the above 1″ sheets to elucidate any association of the disease, Leaf Scorch Decline, to soil physical conditions.

The following soil categories have been observed in relation to geomorphic units. (a) Sandy Regosols of the coastal sandplain (b) Soils of the valleys or Deniya areas, (c) Lateritic soils. *The Kahawa Series:* The inner beach consists of sand on calcareous deposits and the soils are poorly to well-drained. The watertable fluctuates between 36″-60″. The incidence of "Leaf Scorch Decline" in these soils is high.

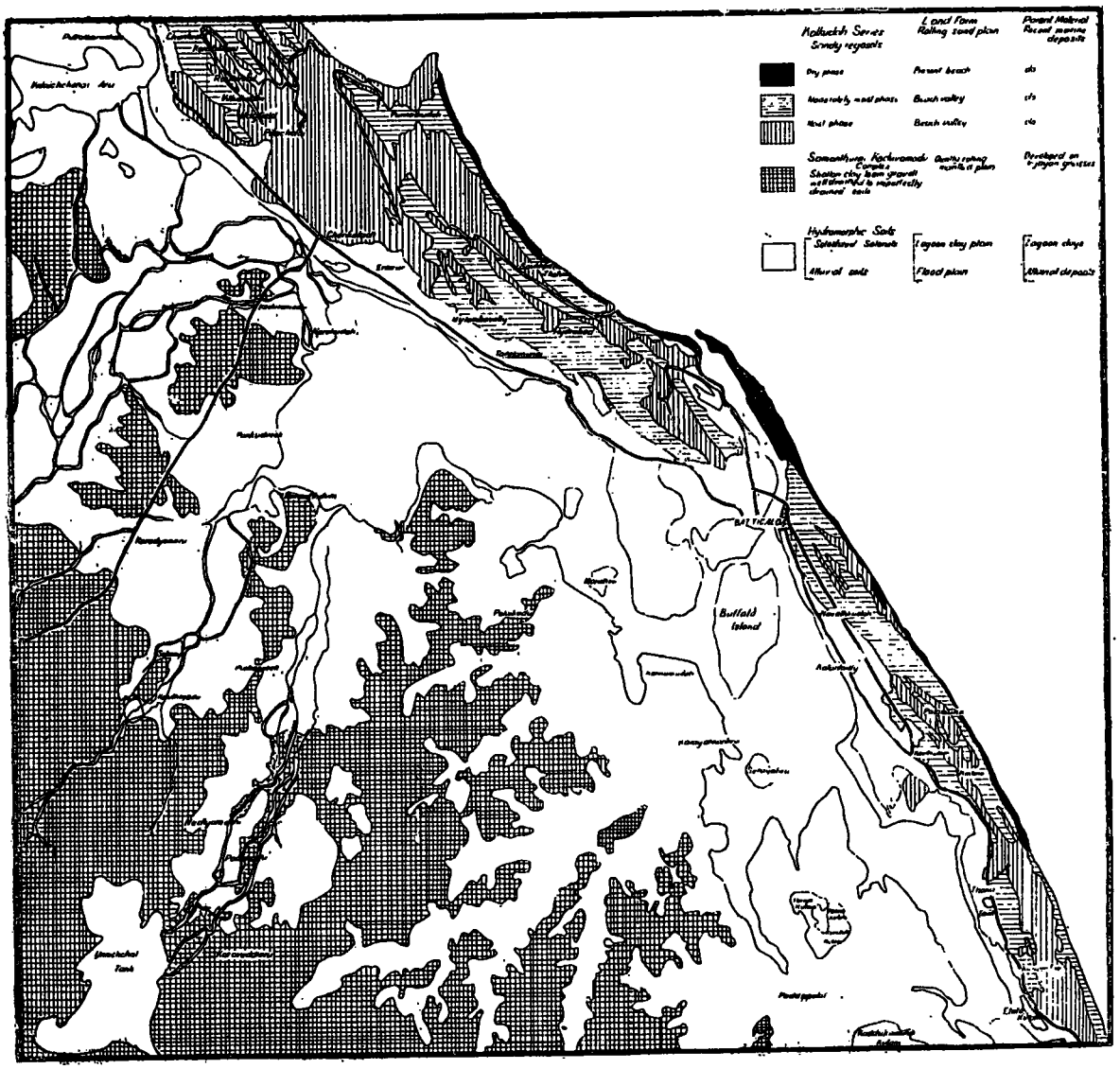
(2) Soils of the Valleys or Deniya areas

High Deniya well drained phase—Soils of the upper valley slopes. "Leaf Scorch Decline" is not observed in these areas.

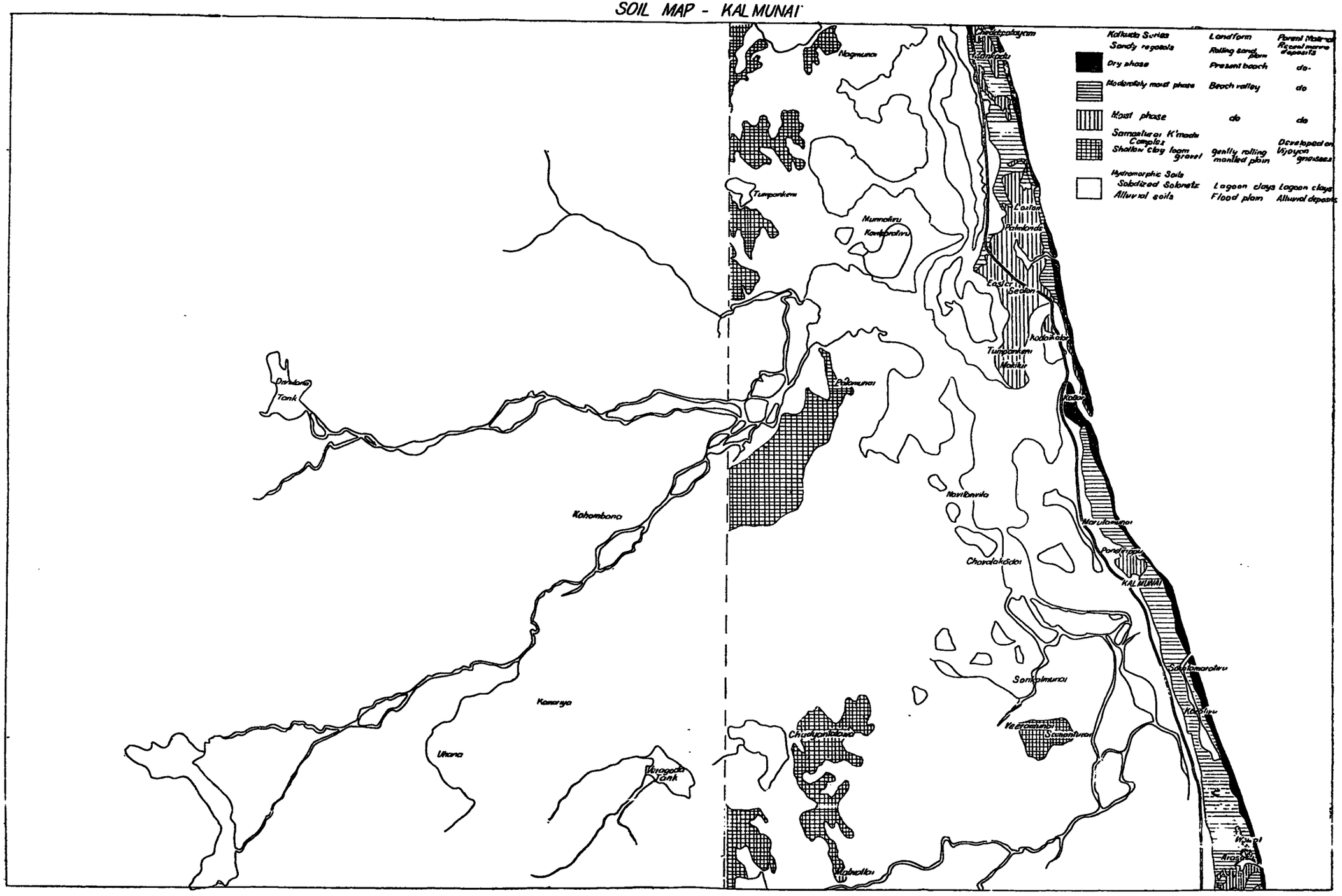
High Deniya Imperfectly Drained Phase—Gleying pronounced between 20″-48″. The extent of the disease is moderate.


SOIL MAP - KALKUDAH
VANDALOOS BAY
KALKUDAH
KALKUDAH BAY
Puhandi
Valaichchenai
From Trincomalee
From Batticaloa
To Batticaloa
N
Mapped K S O Perera
Cartography E.N. Fernando
Landform Rolling sand plain
Ridges
Dry phase
Wet phase
Moderately Wet
Runnels
Kalkudah Series
deep sandy regosols
Laterite gravel
Flood plain
Geology
Recent marine deposits

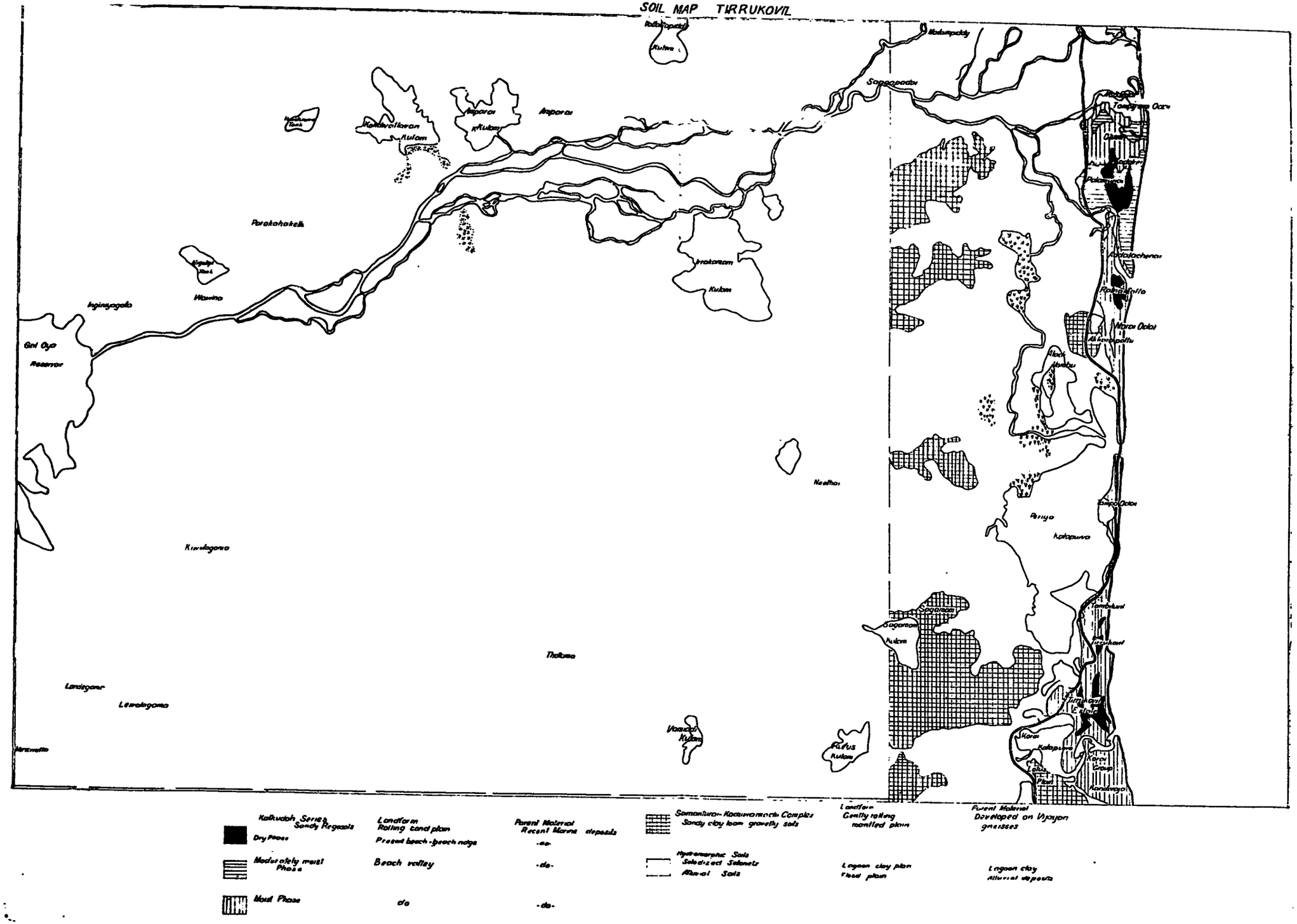
SOIL MAP—BATTICALOA



SOIL MAP - KALMUNAI



Mapped K.S.O Perera


SOIL MAP TIRRUKOVIL
Sappanodai
Amparai
Parakahakelli
Irrakoream
Kulam
Inginyagala
Gal Oya
Reservoir
Wavina
Kiravilagama
Thalluma
Landigamar
Lewalagama
Vasadi
Kulam
Naalhar
Periya
Kalapuwa
Sagamam
Kulam
Tambalagamuwa
Kalkudah Series
Sandy Regosols
Dry Phase
Moderately moist Phase
Moist Phase
Landform
Rolling sand plain
Present beach - beach ridge
Beach valley
do
Parent Material
Recent Marine deposits
-do-
-do-
-do-
Samanturai - Kattaimaruthu Complex
Sandy clay loam gravelly soils
Hydromorphic Soils
Solodized Solonetz
Alluvial Soils
Landform
Gently rolling
mantled plain
Lagoon clay plain
Flood plain
Parent Material
Developed on Vijayan
gneisses
Lagoon clay
Alluvial deposits

Low Deniya soils—These are developed on valley bottoms, and consist of the *Low Deniya Poorly Drained phase*—gleying at -9". A very high incidence of the disease was observed.

Lateritic Soils—The lateritic soils are developed in "islands" surrounded by the Deniya areas, and consists of high and low ridges and slopes.

High Ridge Summit phase—Soils are deep, well-drained. Signs of the disease were absent.

Low Ridge Summit phase—The soils have a gravelly clay hardpan at 3"-9" and present observations indicate that the soils have poor permeability to the conduction of water.

Incidence of disease is high.

Low Ridge Sloping phase—gravelly clay loam, hardpan present between 13"-17". Disease Incidence is high.

The above soil survey is being continued with respect to detailed mapping, and the study of soil physical condition in the field.

D. PERSONNEL

Mr. P. A. Pakkiyam assumed duties as Technical Assistant in May 1969.

Mr. M. A. T. de Silva, Senior Technical Assistant completed his training in trace element analysis at Long Ashton Research Station, Bristol, England. He was awarded the degree of Master of Science by the University of London for his thesis "Interrelationships of iron and manganese in black currant plants as revealed by leaf nutrient contents and associated growth responses". He resumed duties on 23rd June 1969.

Mr. K. D. Anacletus resigned from the post of Technical Assistant in August 1969.

T. S. BALAKRISHNAMURTI,
Acting Soil Chemist,
Coconut Research Institute.

Ceylon Cocon. Quart. (1970) **21**, 40-55.

REPORT OF THE OFFICER-IN-CHARGE AGROSTOLOGY DIVISION - 1969

General

During the year under review a field day on the establishment and management of pasture under coconut was held for the suppliers of milk to the National Milk Board.

Degitaria decumbens (Pangola grass) a principal pasture species of the tropical regions of Central America, the Carribean Islands and the Philippines was introduced to the coconut triangle for detailed experimentation on performance and suitability for the region.

Rainfall during the year was satisfactory at Bandirippuwa Estate with fair distribution, while at Ratmalagara Estate the rainfall was rather low with a severe drought during the months May-October. This drought severely affected pasture production at Ratmalagara Estate during these months.

A. Soil Nutrient Studies:

1. *Kallady Clay Loam:* The following experiments set up during the year with this soil have been completed.

Experiment I

This was a 2^5 factorial pot experiment of N, P, K, Ca and Mg. planted to *Paspalum commersonii* with two replicates of all treatments. The experiment was harvested on five occasions and the data are summarised in Table I. The data indicate that while N and P were responsible for significant increases in yields at all harvests, K was not responsible for any increase in yields. Ca and Mg had no effect on the growth of *Paspalum commersonii*,

TABLE I

			Ca_0		Ca_{10}	
			Mg_0	$Mg_{1\frac{1}{2}}$	Mg_0	$Mg_{1\frac{1}{2}}$
K_0	P_0	N_0	4.13	4.78	4.27	3.58
		N_5	14.21	14.63	14.43	14.98
	P_3	N_0	3.25	4.68	4.08	5.08
		N_5	28.64	27.06	27.87	24.87
K_3	P_0	N_0	3.01	3.76	3.34	2.27
		N_5	14.09	14.48	13.52	13.30
	P_3	N_0	3.79	3.92	3.96	6.36
		N_5	26.96	26.09	27.36	28.88

Total dry matter yield per plant for the 5 harvests taken in experiment I.

Experiment II

This was 2^5 factorial pot experiment of N, P, K, Ca and Mg planted to *Phaseolus lathyroides*. The experiment was harvested on three occasions. The data are similar to those of experiment I and are summarised in Table II.

TABLE II

			Ca_0		Ca_{10}	
			Mg_0	$Mg_{1\frac{1}{2}}$	Mg_0	$Mg_{1\frac{1}{2}}$
		N_0	2.05	2.68	2.95	1.43
	P_0					
		N_5	3.40	3.73	3.27	3.41
K_0						
		N_0	6.98	7.59	8.19	7.84
	P_3					
		N_5	8.40	9.00	8.22	7.68
		N_0	2.30	2.18	2.07	2.55
	P_0					
		N_5	3.21	3.60	3.26	3.11
K_3						
		N_0	7.60	7.14	6.89	8.31
	P_3					
		N_5	7.78	8.50	8.90	7.79

Total Dry matter yield per plant for the three harvests (mean of 2 replicates) for the respective treatments in experiment II.

Experiment III

This was a 2^5 factorial pot experiment of Fe, Cu, Zn, Mn and Mo planted to *Paspalum commersonii*. The experiment was harvested on three occasions and the data are presented in Table III. None of the tested nutrients were found to be deficient in the soil.

TABLE III

			Mn_0		Mn_{14}	
			Mo_0	Mo_1	Mo_0	Mo_1
		Fe_0	34.03	36.40	33.42	33.45
	Cu_0					
		Fe_{14}	30.45	32.23	31.17	32.19
Zn_0						
		Fe_0	33.23	28.93	28.85	20.48
	Cu_{14}					
		Fe_{14}	30.78	31.73	30.04	32.87
		Fe_0	33.83	34.52	32.56	30.82
	Cu_0					
		Fe_{14}	30.76	28.28	29.12	29.44
Zn_{14}						
		Fe_0	30.25	29.16	30.69	32.55
	Cu_{14}					
		Fe_{14}	32.73	33.68	34.26	33.25

Total D.M. yield per plant for the 3 harvests taken in experiment III.

Experiment IV

This was a 4^2 factorial pot experiment of 4 forms of Calcium and 4 forms of Nitrogen planted to *Paspalum commersonii*. The experiment was harvested on 4 occasions. The data indicate that while there was no response to any form of added calcium all forms of added nitrogen increased yield significantly. However, there was no significant difference between the different forms of nitrogen. The data are summarised in Table IV.

TABLE IV

	Ca_0	$Ca(OH)_2$	$CaCO_3$	$CaSO_4$	*Total*
N_0	2.97	3.70	3.92	2.37	12.98
NH_4NO_3	36.29	30.49	30.99	36.80	134.57
$(NH_4)_2SO_4$	32.57	20.86	28.82	38.19	120.44
$CO(NH_2)_2$	32.33	21.12	22.25	30.27	105.97
Total	104.16	76.17	85.98	107.63	

Experiment IV. Total dry matter yield per plant (mean of 2 replicates) for the four harvests for the different treatments.

Experiment V

This was a 4^3 factorial experiment of levels of N, P and K planted to *Paspalum commersonii* with 2 replicates of all treatments. The experiment was harvested on three occasions and the data are presented in Table V. Yields were seen to be depressed at higher levels of K particularly in the presence of lower levels of N and P. This depressive effect appears to have been corrected somewhat at the higher levels of N and P. There was a progressive increase in yield due to N and P at the higher levels tested.

TABLE V

	Treatment	P_0	$P_{1\frac{1}{2}}$	P_3	$P_{4\frac{1}{2}}$	*Total*
N_0	K_0	1.72	4.08	5.45	5.65	16.90
	$K_{1\frac{1}{2}}$	1.01	3.94	5.40	4.63	14.98
	K_3	0.31	4.11	4.88	4.06	13.36
	$K_{4\frac{1}{2}}$	0.66	3.39	4.19	3.47	11.71
N_0	Total	3.70	15.52	19.92	17.81	56.95
$N_{2\frac{1}{2}}$	K_0	2.76	8.52	9.25	11.38	31.91
	$K_{1\frac{1}{2}}$	2.83	9.99	12.38	12.50	37.70
	K_3	0.99	9.54	10.24	12.42	33.19
	$K_{4\frac{1}{2}}$	0.47	7.35	9.58	9.54	26.94
$N_{2\frac{1}{2}}$	Total	7.05	35.40	41.45	45.84	129.74
N_5	K_0	2.83	15.57	18.09	18.02	54.51
	$K_{1\frac{1}{2}}$	3.20	10.13	17.67	15.76	46.76
	K_3	5.07	15.72	17.41	19.84	58.04
	$K_{4\frac{1}{2}}$	5.54	17.41	21.86	22.39	67.20
N_5	Total	16.64	58.83	75.03	76.01	226.51
$N_{7\frac{1}{2}}$	K_0	3.16	17.54	19.12	16.77	56.59
	$K_{1\frac{1}{2}}$	3.46	18.22	21.17	20.84	63.69
	K_3	2.16	15.51	19.38	17.85	54.90
	$K_{4\frac{1}{2}}$	1.67	9.48	11.29	15.23	37.67
$N_{7\frac{1}{2}}$	Total	10.45	60.75	70.96	70.69	212.85
Grand	Total	37.84	170.50	207.36	210.35	

Total dry matter yield per plant for the three harvests (mean of 2 replicates) for the different treatments in experiment V.

Experiment VI

This was a simple experiment to study the effect of sulphur on plants growing in this soil. Five forms of sulphur were tested against the equivalent non-sulphur compounds. The experiment was harvested on 2 occasions and the data are presented in Table VI. The data indicate that at both harvests sulphur increased yields significantly.

TABLE VI

Element	*K*	*Ca*	*Mg*	*H*	*S*	*Total*
S_0	4.20	4.62	4.45	3.45	4.85	21.57
S	10.43	9.84	7.49	11.97	9.96	49.69

Total dry matter yield per plant for the 2 harvests (mean of 3 replicates) for experiment VI.

There was no significant difference between forms of sulphur.

2. Madurankuliya white sands

The following experiments were set up during the year with the above soil.

Experiment VII

This was a 2^5 factorial experiment of N, P, K, Ca and Mg planted to *Paspalum commersonii* with 2 replicates of all treatments. The experiment was harvested on four occasions. The data indicate that while N and K increased yields significantly at all stages of growth P increased yields only at the early stages of growth. At the latter stages of growth P was responsible for slight depression in yield. Mg had no effect at any stage of growth. Ca was responsible for depression in yield which however failed to reach significance. The data are summarised in Table VII.

TABLE VII

			Ca_0		Ca_{10}	
			Mg_0	$Mg_{1\frac{1}{2}}$	Mg_0	$Mg_{1\frac{1}{2}}$
K_0	P_0	N_0	1.17	0.92	1.16	1.16
		N_5	22.81	22.54	19.03	20.56
	P_3	N_0	1.11	1.24	1.67	1.53
		N_5	23.07	23.84	20.09	22.04
K_3	P_0	N_0	1.00	0.84	1.22	1.25
		N_5	28.69	29.47	20.86	20.34
	P_3	N_0	1.13	1.30	1.90	1.44
		N_5	30.89	31.66	26.06	21.03

Total D. M. yield per plant for the 4 harvests (mean of 2 replicates) done in experiment VII.

Experiment VIII

This was a 2^5 factorial pot experiment of N, P, K, Ca and Mg planted to *Phaseolus lathyroides*. The experiment was harvested on 2 occasions. The data indicate that N, P and K were responsible for significant increase in yields. Ca and Mg had no effect in the yield. The fact that this legume showed a heavy response to added nitrogen even when inoculated with the correct rhizobium indicates that other factors in the soil inhibited proper nodulation and the fixation of atmospheric nitrogen. The data are summarised in Table VIII.

TABLE VIII

			Ca_0		Ca_{10}	
			Mg_0	$Mg_{1\frac{1}{2}}$	Mg_0	$Mg_{1\frac{1}{2}}$
		N_0	3.31	3.95	3.61	2.57
	P_0					
		N_5	5.49	5.73	5.46	5.41
K_0						
		N_0	3.43	4.98	3.81	5.83
	P_3					
		N_5	6.03	5.50	5.67	6.25
		N_0	4.23	5.03	4.94	5.16
	P_0					
		N_5	6.18	7.16	5.02	5.12
K_3						
		N_0	6.54	7.94	8.23	7.57
	P_3					
		N_5	8.37	7.51	8.52	8.88

Total dry matter yield per plant for the 2 harvests done in experiment VIII.

Experiment IX

This was a 2^5 factorial pot experiment of N, P, K, Ca and Mg planted to *Sesamum indicum*. The experiment was harvested once. At harvest, the entire plant above ground level was dried and weighed. The data are summarised in Table IX. The data are similar to that obtained in experiment VIII.

TABLE IX

			Ca_0		Ca_{10}	
			Mg_0	$Mg_{1\frac{1}{2}}$	Mg_0	$Mg_{1\frac{1}{2}}$
		N_0	0.61	0.64	0.52	0.50
	P_0					
		N_5	4.22	4.49	2.53	2.56
K_0						
		N_0	0.42	0.47	0.63	0.47
	P_3					
		N_5	4.51	3.34	3.89	1.80
		N_0	0.60	0.53	0.54	0.52
	P_0					
		N_5	4.68	3.23	2.65	2.55
K_3						
		N_0	0.40	0.42	0.36	0.43
	P_3					
		N_5	4.31	2.92	2.26	1.85

Dry matter yield per plant of Sesemum indicum for the different treatments in experiment IX.

Experiment X

This was a 2^5 factorial pot experiment of the minor nutrients Fe, Cu, Zn, Mn and Mo planted to *Paspalum commersonii* with one replicate of all treatments. The experiment was harvested on 2 occasions and the data are presented in Table X. The data indicate that none of the tested nutrients has any effect on the growth and yield of *Paspalum commersonii*.

TABLE X

			Mn_0		Mn_{14}	
			Mo_0	Mo_1	Mo_0	Mo_1
Zn_0	Cu_0	Fe_0	9.32	10.02	9.56	10.43
		Fe_{14}	9.65	7.13	9.96	7.66
	Cu_{14}	Fe_0	10.26	10.05	10.06	10.68
		Fe_{14}	11.00	9.53	10.96	11.30
Zn_{14}	Cu_0	Fe_0	11.01	10.52	9.36	10.03
		Fe_{14}	10.51	10.96	7.63	10.27
	Cu_{14}	Fe_0	11.77	9.85	12.13	11.32
		Fe_{14}	10.15	10.86	11.10	9.94

Total dry matter yield per plant for the 2 harvests taken in experiment X.

Experiment XI

This was a 4×4 factorial experiment on four forms of nitrogen and four forms of calcium planted to *Paspalum commersonii*. The experiment was harvested on 2 occasions and the data indicate that while all forms of added calcium depressed yields there was no difference in yield due to the different forms of nitrogen. The data are summarised in Table XI.

TABLE XI

	N_0	NH_4NO_3	$(NH_4)_2SO_4$	$CO(NH_2)_2$	*Total*
Ca_0	1.08	36.45	32.79	27.39	97.71
$Ca(OH)_2$	1.89	27.84	23.22	17.26	70.21
$CaCO_3$	1.99	28.83	23.92	19.30	74.04
$CaSO_4$	0.91	33.43	30.58	30.53	95.45
Total	5.87	126.55	110.51	94.48	337.41

Total dry matter yield per plant (mean of 2 replicates) for the 2 harvests taken in experiment XI.

Experiment XII

This was a 4 × 4 factorial experiment of four forms of calcium and four levels of nitrogen with 2 replicates of all treatments planted to *Paspalum commersonii*. The experiment was harvested on three occasions and the data are summarised in Table XII.

TABLE XII

	N_0	$N_{2\frac{1}{2}}$	N_5	$N_{7\frac{1}{2}}$	*Total*
Ca_0	1.39	17.70	27.19	28.22	74.50
$Ca(OH)_2$	2.07	9.84	24.21	28.72	64.84
$CaCO_3$	1.86	10.07	22.39	26.97	61.29
$CaSO_4$	1.31	16.30	26.16	23.25	67.02
Total	6.63	53.91	99.95	107.16	267.65

Total dry matter yield per plant (mean of 2 replicates) for the 2 harvests taken in experiment XII.

The data show that all forms of calcium tested depressed yields at all levels of nitrogen applied when compared to the control.

Experiment XIII

This was a 4 × 4 factorial experiment on 4 levels each of Magnesium and calcium; with 2 replicates of all treatments planted to *Phaseolus lathyroides*. The experiment was harvested on three occasions and the data are presented in Table XIII. The data indicate that none of the nutrients increased yields significantly at any tested level of application.

TABLE XIII

	Mg_0	Mg_1	$Mg_{1\frac{1}{2}}$	Mg_4	*Total*
Ca_0	8.16	8.90	8.87	9.87	35.75
Ca_5	10.53	10.22	8.01	11.09	39.85
Ca_{10}	10.29	10.07	10.90	10.03	41.29
Ca_{15}	9.73	10.01	10.52	10.47	40.73
Total	38.71	39.20	38.30	41.41	

Total dry matter yield per plant (mean of 2 replicates) for the 2 harvests taken in experiment XIII.

Experiment XIV

This was a 4×4×4 factorial experiment on four levels each of P, K and Mg. planted to *Paspalum commersonii* with 2 replicates of all treatments. The experiment was harvested on three occasions and the data are presented in Table XIV.

TABLE XIV

Treatment		P_0	$P_{1\frac{1}{2}}$	P_3	$P_{4\frac{1}{2}}$	Total
Mg_0	K_0	35.24	36.96	35.96	39.16	147.32
	$K_{1\frac{1}{2}}$	35.42	44.63	43.61	43.63	167.29
	K_3	36.48	44.28	46.58	44.96	172.30
	$K_{4\frac{1}{2}}$	40.11	42.86	47.40	51.43	181.80
Mg_0	Total	147.25	168.73	173.55	179.18	668.71
Mg_1	K_0	36.96	41.86	38.42	33.75	150.99
	$K_{1\frac{1}{2}}$	36.34	43.56	37.54	38.91	156.35
	K_3	39.48	40.04	43.90	44.99	168.41
	$K_{4\frac{1}{2}}$	41.63	48.30	48.36	44.19	182.48
Mg_1	Total	154.41	173.76	168.22	161.84	658.23
Mg_2	K_0	37.78	38.85	35.90	39.86	152.39
	$K_{1\frac{1}{2}}$	37.78	41.95	36.94	43.38	160.05
	K_3	37.43	42.89	43.16	44.76	168.24
	$K_{4\frac{1}{2}}$	35.18	40.55	44.58	45.53	165.84
Mg_2	Total	148.17	164.24	160.58	173.53	646.52
Mg_4	K_0	32.06	34.56	34.79	34.88	136.29
	$K_{1\frac{1}{2}}$	35.31	39.35	34.21	39.72	148.59
	K_3	35.80	42.79	35.03	41.21	154.83
	$K_{4\frac{1}{2}}$	35.20	42.92	38.96	43.69	160.77
Mg_4	Total	138.37	159.62	142.99	159.50	600.48
Grand	Total	588.20	666.35	645.34	674.05	2573.94

Total dry matter yield per plant for the three harvests taken (mean of 2 replicates) in experiment XIV.

Experiment XV

This was a 4 × 4 factorial experiment of four levels each of N and P planted to *Paspalum commersonii* with 2 replicates of all treatments. The experiment was harvested on three occasions and the data are presented in Table XV. The data indicate a progressive increase in yield with increase in the level of nutrient application.

TABLE XV

	P_0	$P_{1\frac{1}{2}}$	P_3	$P_{4\frac{1}{2}}$	*Total*
N_0	1.30	1.22	1.08	1.38	4.98
$N_{1\frac{1}{2}}$	15.79	14.99	16.23	15.41	62.42
N_3	20.70	19.97	24.64	26.27	91.58
$N_{4\frac{1}{2}}$	21.15	26.43	24.62	25.45	97.65
Total	58.94	62.61	66.57	68.51	

Total dry matter yield per plant (mean of 2 replicates) for the three harvests taken in experiment XV.

Experiment XVI

This was a 4 × 4 factorial experiment of four levels of N and K each planted to *Paspalum commersonii* with two replicates of all treatments. The experiment was harvested on three occasions and the data are presented in Table XVI.

TABLE XVI

	K_0	$K_{1\frac{1}{2}}$	K_3	$K_{4\frac{1}{2}}$	*Total*
N_0	1.42	1.17	1.27	1.32	5.18
$N_{2\frac{1}{2}}$	15.16	14.54	15.97	14.48	58.15
N_5	22.90	23.10	25.24	29.05	100.29
$N_{7\frac{1}{2}}$	22.70	28.10	26.98	28.74	106.52
Total	60.18	66.91	69.46	73.59	

Total dry matter yield per plant (mean of 2 replicates) for the three harvests taken in experiment XVI.

3. Mawathagama soils

Soils from Delgolla Estate Mawathagama in the Kurunegala district were sampled towards the latter part of the year and the following experiments set up.

Experiment XVII

This was a 2^5 factorial experiment of N, P, K, Ca and Mg planted to *Paspalum commersonii*, *Phaseolus lathyroides* and *Sesamum indicum* with 2 replicates of all treatments for Paspalum and with one replicate for the other two species. The experiment is in progress.

Experiment XVIII

This was a 2^5 factorical experiment of Fe, Cu, Zn, Mn and Mo planted to *Paspalum commersonii* and *Phaseolus lathyroides* with one replicate of all treatments. The experiment is in progress.

Experiment XIX

This was 4 × 4 factorial of four forms of N and four forms of Ca planted to *Paspalum commersonii* and *P. lathyroides* with two replicates of all treatments. The experiment is in progress.

Experiment XX

This was a 4 × 4 factorial experiment of four levels each of P and K planted to *Paspalum commersonii* with two replicates of all treatments. The experiment is in progress.

Experiment XXI

This was a 4 × 4 factorial experiment of four levels each of P and Mg planted to *Paspalum commersonii* with two replicates of all treatments. The experiment is in progress.

B. Intercropping with coconut

Effect of pasture on nut yields

1. Intensity of grazing and level of manuring on the yield of coconut (P_5 R/E)

This experiment completed six years in 1969. Manuring was done in May and November and grazing done to schedule. The uncorrected nut yield data and the herbage yield for the year are presented in Table XVII.

TABLE XVII

Treatment		*Herbage yield Gm/M²*	*No. of nuts acre*
Weed control	FN GO	264.8	4454
B.brizantha	FN GO	498.9	2300
,,	FN GH	383.0	3468
,,	FH GN	492.3	4201
,,	FN GN	490.1	3984
,,	FH GH	314.2	5336

F=Fertilizer, G=Grazing O=Nil,
N=Normal, H=Heavy

Number of nuts/acre (uncorrected) and dry matter yield of herbage (gm/M²) due to levels of manuring and grazing a coconut/B.brizantha pasture association.

It will be seen from the data that the establishment of the pasture and having it ungrazed has been responsible for a sharp drop in the yield of coconut. This trend is corrected to a certain degree by grazing the pasture. The normal level of fertilizer in this experiment is a mixture of 2 cwt/acre of Sulphate of ammonia, 1 cwt/acre each of saphos phosphate and muriate of potash applied broadcast per year for both crops. It is apparent that at this level of fertilizer application there is heavy competition between the pasture and the coconut for plant nutrients.

10389—5

2. The effect of level of fertilizer (N.P. and K) on a coconut pasture association (P_{21}R/E)

This experiment was manured and grazed to schedule during the year. All the plots in this experiment were grazed at an intensity of 2 adult Sinhala animals per acre. The data for the 6th year are presented in Table XVIII. As reported last year there appears to be a depression in the nut yield at the higher level of applied N. A feature of interest in this experiment is the gradual replacement of B.brizantha by B.miliiformis. This has been particularly evident in replicate three where the shade is heavier than in the other two replicates.

TABLE XVIII

Treatment	*Herbage yield D.M.(gm/M^2)*	*No. Nuts/acre*
N_2 P_1 K_1	490.1	3984
N_2 P_1 K_2	442.0	4525
N_4 P_1 K_1	607.3	3813
N_4 P_1 K_2	562.5	4291
N_2 P_2 K_1	382.9	4165
N_2 P_2 K_2	444.9	4827
N_4 P_2 K_1	394.3	4091
N_4 P_2 K_2	492.3	4201

No. of nuts per acre (uncorrected) and the yield of pasture (gm/M^2) of a coconut B.brizantha pasture association due to levels of fertilizer applied broadcast.

3. Levels of fertilizer × pasture management on the yield of coconut and pasture (P_{22} R/E)

This experiment was manured and managed to schedule during the year. The experiment has now completed five years and the data for the fifth year are presented in Table XIX. There does not appear to be a significant difference in the nut yield due to the method of management of the pasture. The yield of pasture is increased due to grazing when compared to mowing. A progressive increase in the yield of pasture due to the increase in level of fertilizer has been recorded.

TABLE XIX

Treatment	*Herbage yield D.M. gm/M^2*	*No. of nut per acre*
½ Fertilizer pasture mown	158.2	3760
1 ,, ,,	220.7	3956
2 ,, ,,	184.1	3973
4 ,, ,,	297.7	4083
½ Fertilizer pasture grazed	172.0	3523
1 ,, ,,	227.8	3782
2 ,, ,,	214.5	4509
4 ,, ,,	382.5	3724

Herbage yield and the number of nuts per acre (uncorrected) due to levels of fertilizer application and different management of a B.miliiformis coconut association.

4. The effect of frequency and intensity of grazing on *B.brizantha* under coconut

The data for the 2nd year of this experiment are presented in Table XX. More frequent grazing appears to produce more herbage than less frequent grazings. Grazing at the higher intensity also appears to increase the yield of pasture.

TABLE XX

Treatment		*Herbage yield D.M. gm/M²*	*No. of nuts per acre*
Grazing once in 2 weeks)	High intensity	839.1	2547
,, ,, 4 ,,		633.1	3091
,, ,, 6 ,,		466.2	2022
Grazing once in 2 weeks	Low intensity	754.1	2720
,, ,, 4 ,,		533.4	2547
,, ,, 6 ,,		380.2	2659
No grazing control		183.0	1840

Herbage yield and number of nuts per acre (uncorrected) for the different frequencies and intensities of grazing of B.brizantha under coconut.

5. The effect of rates of application of nitrogen to a coconut/pasture association ($P_{12}B/E$)

This experiment was grazed and manured to schedule during the year. The uncorrected nut yield data and the herbage yields for the 6th year are presented in Table XXI. The data indicate that the establishment of *Panicum maximum* has depressed the nut yields at all levels of applied nitrogen compared to the weed control treatment. The nut yields of the plots planted to *B.brizantha* and *B.miliiformis* have increased compared to the weed control treatment. The association effect due to *B.miliiformis* appears to be better than that due to *B.brizantha*.

TABLE XXI

Treatment		*Herbage yield gm/M²*	*No. of nuts par acre*
Control (weeds)	N_1	580.0	3154
	N_2	391.6	3089
	N_4	449.5	3328
B.miliiformis	N_1	406.7	3665
	N_2	554.2	4357
	N_4	485.6	5030
B.brizantha	N_1	346.8	4235
	N_2	398.4	4399
	N_4	383.8	4510
P.maximum	N_1	480.6	3063
	N_2	540.6	2306
	N_4	633.2	3157

Number of nuts/acre (uncorrected) and the herbage yield (D.M. gm/M²) due to the levels of nitrogen applied to the different pasture/coconut associations.

6. Fertilizer placement to a coconut cum B.milliformis association (P_{38} B/E)

Data for the 4th year are presented in Table XXII. Similar trends as reported in last year's annual report have been observed this year too.

TABLE XXII

Treatment		*Herbage yield D.M. gm/M²*	*No. of nuts per acre*
Total placed	Fertilizer	175.4	3166
½ placed + ½ broadcast	normal	249.4	3522
Total broadcast	(7 lbs./palm)	483.2	2772
Total placed	Fertilizer	166.9	3265
½ placed + broadcast	twice normal	486.6	3219
Total broadcast	(14 lbs. per palm)	645.8	3484

Yield of coconut (No. of nuts acre) and the herbage (D.M. gm/M²) due to level and placement of fertilizer to a coconut B.miliiformis association.

Selection, establishment and management of pasture species.

1. The effect of levels of nitrogen and frequency of cutting on the yield and protein content of Pangola grass (Digitaria decumbensi)

This was a 2 × 4 factorial experiment for four levels of N (0, 1, 2 and 4 cwt/acre of $(NH_4)_2SO_4$) and 2 frequencies of cutting (4 and 8 week intervals) on the yield and protein content of Pangola grass. 2 cycles of defoliation were completed during the year and the data are summarised in Table XXII.

TABLE XXIII

Treatment		*Herbage yield D.M. gm/M²*	*o/o crude protein*
Cut every 4 weeks	N_0	510.3	8.76
	N_1	762.3	10.81
	N_2	999.1	10.63
	N_4	1062.3	14.29
Cut every 8 weeks	N_0	721.7	6.22
	N_1	1021.5	6.10
	N_2	1488.1	5.71
	N_4	1599.1	8.26

Herbage yield (D.M. gm/M²) and percent crude protein of Pangola grass due to levels of nitrogen applied and frequencies of defoliation.

The data indicate that significant yield increases were obtained due to increasing levels of nitrogen application. Herbage yields also increased when the pasture was defoliated every 8 weeks compared to defoliations every 4 weeks. The crude protein content of the herbage also increased with increased levels of nitrogen application. A significant drop in the protein content of the herbage was observed due to lax defoliations as against frequent defoliations.

2. The effect of level of nitrogen applied and frequency of defoliation on the herbage yield and crude protein content of B.miliiformis

This was a 3 × 3 factorial experiment on 3 levels of nitrogen application (0, 1 and 2 cwt/acre of sulphate of ammonia) and 3 frequencies of defoliation (2, 4 and 6 week intervals) on the herbage yield and protein content of *B.miliiformis* growing under coconut at R/E. The experiment was set up during the October/November rainy season and one cycle of defoliation was completed during the year. The data are presented in Table XXIII. Significant increases in yield due to increase in the level of nitrogen application have been obtained. Dry matter yields also increased with the increase in the interval between defoliations. The reverse relationship was observed with the crude protein content of the herbage.

TABLE XXIV

Treatments		*Herbage yield D.M. gm/M²*	*Percent crude protein*
Cut every 2 weeks	N_0	28.3	9.83
	N_1	45.6	8.22
	N_2	56.0	11.46
Cut every 4 weeks	N_0	39.0	11.72
	N_1	118.3	12.08
	N_2	117.0	10.67
Cut every 6 weeks	N_0	69.0	7.84
	N_1	122.0	6.58
	N_2	149.0	10.04

Dry matter yield and percentage crude protein of B.miliiformis due to levels of nitrogen application and frequencies of defoliation.

3. Comparison of the N-recovery of 13 varieties of pasture grasses

The 13 grasses compared were—

1. *Brachiaria brizantha*
2. *Brachiaria brizantha* (Tanganika)
3. *Brachiaria ruziziensis*
4. *Brachiaria brizantha* (F.D.A. 15072)
5. *B.miliiformis*
6. *B.mutica*
7. *Eurocloa* species
8. *Paspalum commersonii*
9. *Paspalum notatum*
10. *Paspalum plicatulum*
11. *Digitaria decumbens* (Pangola)
12. *Panicum choloratum*
13. *Setaria sphacelata* (Nandi)

The experiment was of a randomised block design with three replicates of each variety. Each plot was 10′ × 20′ situated within a coconut square. All species were defoliated at 4 weekly intervals, after the sampling each plot received 1 lb. of urea, applied broadcast. The dry matter yields for all the harvests done during the year are recorded in Table XXIV. Chemical analyses have not been completed for the N-recovery to be computed.

TABLE XXV

Pasture variety	*Herbage yield D.M. gm/M²*
Brachiaria brizantha	175.2
Brachiaria brizantha (Tanganika)	213.1
Brachiaria ruzeziensis	162.6
Brachiaria brizantha (*FDA* 15072)	202.5
Brachiaria miliiformis	164.8
Brachiaria mutica	117.8
Eurocloa species	137.9
Paspalum commersonii	119.2
Paspalum notatum	148.2
Paspalum plicatulum	141.2
Digitaria decumbens	162.3
Panicum cholaratum	98.0
Setaria specilata	156.9

Dry matter yield per sampling (mean of three replicates) of the different pasture varieties tested.

4. The effect of levels of N-application and frequencies of defoliation on the yield of *Panicum maximum*.

The frequencies of defoliation in this experiment were at 3 and 6 week intervals. The levels of nitrogen were $\frac{1}{2}$, 1, 2, 4 and 8 cwt/acre of sulphate of ammonia. The experiment was planted during the May-June rainy season and one cycle of defoliation was completed. The herbage yields for the cycle completed are presented in Table XXV.

TABLE XXVI

Treatments		*Herbage yield D.M. gm/M²*
Cut every 3 weeks	$N_{\frac{1}{2}}$	340.1
	N_1	318.6
	N_2	364.2
	N_4	378.5
	N_8	363.9
Cut every 6 weeks	$N_{\frac{1}{2}}$	422.9
	N_1	348.5
	N_2	457.6
	N_4	413.2
	N_8	369.1

Herbage yield (D.M. gm/M²) due to levels of nitrogen and frequencies of defoliation of Panicum maximum planted 2.5 ft. square.

The effect due to levels of applied nitrogen are not evident due to the fairly high soil nutrient status of the area where the trial was conducted. However, this should show up once the soil nitrogen is depleted.

5. Methods of introducing a legume into an established pasture of B.miliiformis

In this experiment two methods of treating the pasture before planting the legume seed is combined with three methods of planting the seeds, of two varieties of legumes. The design is a randomised block design with the pasture treatment in main blocks, and the method of planting the legume seed in sub plots with three replicates of all treatments. The treatments are as follows:

A	Seeds planted		broadcast	} Pasture mowed.
B	,,	,,	in rows	
C	,,	,,	in hills	
D	,,	,,	broadcast	} Pasture harrowed.
E	,,	,,	in rows	
F	,,	,,	in hills	

The 2 legume species were (a) *Phaseolus atropurpureus* (Siratro) and (b) Centrosema pubescens.

The experiment was planted in December and is in progress.

CATTLE: Herd statistics—

Herd Strength on 31.12.69

	B/E	*R/E*	*Total*
Bulls	02	02	04
Cows	56	28	84
Heifer calves	110	30	140
Bull Calves	54	08	62
Total	222	68	290

80 animals comprised of 01 bull, 26 cows, 43 bull calves and 10 heifer calves were sold, during the year. There were 60 and 25 births at B/E and R/E respectively.

Milk Yield

A total of 86,645 pints of milk were produced at the two Stations, B/R and R/E. 62,870 pints were offered to the Milk Board and of that 600 pints were rejected. 20,840.5 pints were sold to the Staff and a further 2780 pints were converted into ghee. The balance was fed to calves.

Staff

Mr. S. A. Ratnayake Lab. and Field Attendant left the services of the Division in March.

D. E. F. FERDINANDEZ,
Officer-in-Charge,
Agrostology Division.

Ceylon Cocon. Quart. (1970) **21**, 56-59.

REPORT OF THE CROP PROTECTION OFFICER 1969

Two features which characterize coconut cultivation in Ceylon influence methods of pest control to a considerable extent. Firstly, coconut gives a low income per acre; this means that pest control measures must be cheap. The second feature is the low level of management. This generally means that control measures are not implemented effectively in certain areas; consequently pests spread from badly managed areas to well managed holdings. One way of getting over this situation is to utilise methods of control (such as biological control, sterile male technique etc.) which can be carried out by a comparatively few people working from co-ordinated centres. These methods may be cheaper than regular chemical treatment.

Thus, during the year under review emphasis was laid on biological control, the use of traps, attractants, the sterile male technique etc. in the control of insect pests of coconut. Already the Coconut Caterpillar is regulated through the release of some of its parasites. Attempts are being made to control two other pests, the Red Weevil, and the Rhinoceros Beetle, by some of the methods mentioned above.

The Division is also concerned with diseases and disorders of coconut. Some advance was made in elucidating the causes of Leaf Scorch Decline, a disorder prevalent in the Southern Province of Ceylon.

Coconut Caterpillar ***Nephantis serinopa*** **Meyr:**

The following parasites of the Coconut Caterpillar were multiplied in the Parasite Breeding Stations at Mylambavelly and Lunuwila: *Microbracon brevicornis* W. (Braconidae), *Perisierola nephantidis* M. (Bethylidae), *Spoggosia* (*Stomatomyia*) *bezziana* Bar. (Tachinidae) *Nythobia* (*Diocetes*) sp. (Ichneumonidae), *Elasmus nephantidis* (Elasmidae), *Tetrastichus israeli* M and K (Tetrastichidae) and *Trichospilus pupivora* F. (Eulophidae). Parasites were released in estates in which the pest was present.

There were no major outbreaks of the Coconut Caterpillar during 1969.

Census data on fluctuations of the pest population densities were collected regularly from four estates in the North Western Province, one estate in the Western Province and five estates in the Eastern Province. Recording was started in another estate in the N. Western province.

The sampling methods give estimates of the pest population densities and mortalities caused by different parasites. At present parasite population densities are not estimated in the field, although numbers of parasites released in each estate are available.

Population counts were started in Bone Island, a small island in the Batticaloa lagoon, with the object of studying parasitism by *Spoggosia*. Two population counts were taken before releasing the parasite; thereafter counts were taken at two-weekly intervals. The first two census indicate that pest larvae were parasitised by *Apanteles* sp., *P.nephantidis*, *Nythobia* sp. and *S.bezziana*. One instance of pupal parasitism by an unidentified parasite was observed. Only *S.bezziana* was released in the island.

Red Weevil *Rhynchophorus ferrugineus* F.

A preliminary survey of the insect co-inhabitants of the Red Weevil did not reveal indigenous parasites or predators of any importance in Ceylon.

A trap to collect Red Weevil adults was developed in Trinidad (1). This was tested under field conditions in two estates in the North Western Province. It was found that "split coconut petiole bait" placed in traps attracted more weevils than coconut "cabbage". In one estate 302 Red Weevils were recovered from ten traps, with coconut petiole bait, in 141 days. In the other estate 18 adults were recovered from 10 traps in 66 days. During these periods there was a decline in the number of palms attacked by the pest. Traps appear to be effective in reducing populations of Red Weevil and consequently, the number of palms attacked by the pest. The trap will be recommended for general use, depending on the results of field trials in progress.

It is well known that the Red Weevil is attracted to fresh wounds on trunks of young palms and leaf petioles. If the exact nature of the attractant in coconut is determined, it should be possible to use it in traps to collect Red Weevils in the field. Preliminary laboratory trials were begun with this end in view.

Laboratory experiments indicated the possibility of a sex pheromone in female Red Weevils attracting males. This aspect will be investigated in detail in 1970.

Experiments on irradiation of the Red Weevil were initiated.

Rhinoceros Beetle, *Oryctes rhinoceros* L.

Studies on population fluctuations of the Rhinoceros Beetle were carried out on a holding near Bandirippuwa Estate.

Insect co-inhabitants of the pest from a number of localities were collected (Descriptions of these will be published elsewhere). *Metarrhizium anisopliae*, a fungus causing a disease in larvae of the pest occurred extensively.

Platymerus lericollus (imported from Western Samoa) was reared in the laboratory. They were fed mainly on larvae of *Corcyra cephalonica* and *Prodenia litura*. *Platymerus* has a wide host range. It is predatory on the Rhinoceros Beetle and an attempt is being made in the Pacific Islands to control the pest through *Platymerus*. It was imported into this country in the hope that it will be a useful predator of the Rhinoceros Beetle. However, it appears that *Platymerus* prefers the Red Weevil to *Oryctes*.

Coconut Scale, *Aspidiotus destructor* Sign

Census of population densities of the Coconut Scale and its predator, *Chilochorus nigritus* were carried out on three estates in the North Western Province. Spraying was carried out (by the Advisory Division) on two estates as a large number of palms were affected by the pest. *Chilochorus nigritus* was abundant in the other estate and this was not sprayed. From these field trials it is hoped to determine the effect of the predator on the pest; and the effects of spraying insecticide on the pest-predator complex.

Nettle Grub, *Parasa lepida* **Cram**

The parasite-predator complex of the Nettle Grub was studied in collaboration with Mr. M. B. Wickremasinghe of the Department of Zoology, University of Ceylon, Colombo. (2).

Crop losses due to pest damage

Pre-experimental yield records were taken on 282 palms at Bandirippuwa Estate. These palms will be used in a field trial to assess crop losses due to defoliation. Unfortunately, a considerable proportion of fallen and harvested nuts were stolen from the experimental area! An attemp will be made to prevent theft by labelling nuts and placing them in an enclosed area.

Leaf Scorch Decline in Coconut

We reported our preliminary findings of the relationships between soil types and Leaf Scorch in the Annual Report for 1968. The Soil Survey of the Gonapinuwela area (carried out by the Soil Chemistry Division) was continued during 1969. Counts of the number of palms affected by Leaf Scorch were taken on each soil type. The results of these detailed studies confirmed our earlier findings that Leaf Scorch was more prevalent on lateritic soil which has a hard pan occurring at a shallow depth; and ill-drained and water logged "deniya" soils. *Fusarium* spp. and *Cylindrocarpon* sp. were found in these soils.

Studies on coconut roots in lateritic soil showed that growth is considerably retarded when roots strike the hard pan. Root growth was accelerated when pits near palms were filled with river sand. This had a beneficial effect on palms.

The lands in the Southern Province of Ceylon have been cultivated for a long period. Some of the coconut lands were previously cultivated with rubber, cinnamon and citronella. Generally, soil and water conservation measures are not carried out on these lands.

The present evidence suggests that adverse soil conditions and bad land management are partly responsible for the occurrence of Leaf Scorch in the Gonapinuwela area. It appears that a solution to the problem may be better and more effective land management, and land utilization.

A paper on these investigations is in preparation.

Bud-Rot

A field trial to test the effects of placing fungicides near the bud region of palms, as a preventive measure against Bud-Rot, was laid down.

Review of Literature on Pests and Diseases of Coconut

During the past two years an attempt was made to build up an exhaustive review of research carried out on pests and diseases of coconut and other aspects of coconut cultivation.

Comprehensive literature reviews of pests and diseases of coconut are not available; it is hoped that the work in progress will fill this gap to some extent.

Staff

Mr. C. P. Wickremaratne, Technical Assistant, resigned in February 1969. Mr. P. Chandrasiri who was appointed Technical Assistant in June, resigned in October 1969. The post of Research Assistant could not be filled.

Publications

The following papers were published:—

Ekanayake, U. B. M. (1969) A plea for an Institute of Ecology. *Ceylon Daily News*. 23rd June 1969.

Ekanayake, U. B. M. (1969) Ecology and the Mahaweli Diversion Scheme. *Loris*, **11**, 332.

The following leaflet was revised:—

Leaflet No. 41—Bud Rot.

General

Some difficulty was experienced in implementing the research programme of the Division, approved in 1968, due to lack of adequate staff. There were delays in obtaining materials for experimental work, through official channels.

References

1. MAHARAJ, S. (1965) A new design for collecting the Palm Weevil, *Rhynchophorus palmarum* (L). *Trop. Agriculture Trin.* **42**, 373-375.
2. WICKREMASINGHE, M. B. (1969) *Chrysis shanghaiensis* (Hymenoptera: Chrysidae), a new species to Ceylon. *Ceylon Coconut Quart.* **20**, 131-133.

U. B. M. EKANAYAKE,
Crop Protection Officer.

Ceylon Cocon. Quart. (1970) 21, 60-62.

REPORT OF THE BIOMETRICIAN (1969)

1. Statistical Service

(1) Routine analyses of the experiments of the Research Divisions and advice to Research Officers regarding experiments and interpretation of analytical results were attended to.

(2) A good portion of the working time of the Division during the year was spent on the collection and summarizing of statistics regarding fertilizer usage.

(3) Three village surveys, wherein the field officers of the Advisory Division collected information on various aspects of coconut cultivation, damage due to cyclone and extent of rehabilitation since the cyclone, were analysed and reports prepared for circulation.

2. Research

(1) *Crop-Forecasting Project*

Work on this project continued and attempts were made to generalize the approach. The successful formulation of the relationship between rainfall and crops at Bandirippuwa Estate was of an *ad hoc* nature. The parameters incorporated into the formula, applied specifically to Bandirippuwa rainfall pattern, and it may not necessarily apply to drier areas. Therefore a more generalized analytical approach which would be applicable to any rainfall distribution has to be evolved as a preliminary to any further work on crop forecasting on a regional or island wide basis. However work on this generalised approach, was drastically curtailed, due to the fact that the collection of statistics of fertilizer usage and analysis of surveys etc. took up all the staff time available after attending to the normal routine duties of the division.

(2) *Calibration Trial*

The recordings of the Calibration Trial at Ratmalagara Estate were maintained as per schedule.

Data on mature nutfall available in this experiment were extracted in order to obtain a preliminary idea of the extent of mature nutfall in the different picks within a year. A note on this is now in preparation for publication in the Ceylon Coconut Planters' Review.

(3) *Agri-Meteorology*

(i) Meteorological Stations

The meteorological stations at Bandirippuwa, Ratmalagara and the Isolated seed garden were maintained satisfactorily.

(ii) Rainfall 1969 and Crop-prospects 1970.

TABLE I

Rainfall and its distribution in Important Coconut Growing Areas in Ceylon

STATION	*TOTAL RAINFALL (Inches)*			*EFFECTIVE RAINFALL*			*DISTRIBUTION INDICES**		
	1969	1968	*Av.* (53-68)	1969	1968	*Av.* (53-68)	1969	1968	*Av.* (53-68)
LUNUWILA (Bandirippuwa Estate)	73.49	69.61	79.27	71.50	69.61	74.38	(1) 1.7428 (2) 2.1880	(1) 1.8778 (2) 2.8032	(1) 1.8928 (2) 2.7927
MADAMPE (Ratmalagara Estate)	53.99	61.83	64.29	52.69	61.83	61.78	(1) 1.4000 (2) 1.6463	(1) 1.6397 (2) 2.4775	(1) 1.6669 (2) 2.2779
CHILAW	57.34	51.38	62.86	57.18	50.25	59.29	(1) 1.2494 (2) 1.5651	(1) 1.2153 (2) 1.6664	(1) 1.5100 (2) 2.0330
PUTTALAM	44.63	41.54	46.93	42.58	41.54	45.38	(1) 1.0292 (2) 1.1775	(1) 1.0697 (2) 1.2962	(1) 1.2468 (2) 1.4951
KURUNEGALA	79.62	87.12	85.68	73.76	82.84	80.25	(1) 1.6442 (2) 2.1887	(1) 1.9180 (2) 2.8081	(1) 2.0015 (2) 2.8622

Note:

*Distribution Index (1)— Mean/Standard Deviation for monthly rainfall totals.
Distribution Index (2)— Mean/Standard Deviation for two monthly moving averages of the monthly rainfall totals.

Around Lunuwila, although the total and effective rainfall in 1969 has improved over that of 1968, the distribution has been poorer. The crop in this area may not improve over 1968 especially during the early picks.

In areas around Madampe, the effective rainfall as well as the distribution has been much lower. Therefore the crops of the early part of the year will show a sharp drop. The crops of the latter part of the year may show a certain amount of recovery.

In Chilaw area, there is an improvement in the total effective rainfall but the distribution is poorer. In fact the South West monsoon has been a failure. Here too crops will decline appreciably.

Puttalam area too will show similar trends as Chilaw area.

Kurunegala area, with a lower total effective rainfall and poorer distribution will show a decline in yield in 1970.

Thus the general prospects for the coconut industry in 1970 are pretty bleak, unless the price factor compensates.

4. Production and Exports

(1) *Production*

The estimated production of coconuts in Ceylon for the year 1969 is 2616 million nuts. This is 5.4% less than 1968, 6.2% less than the last five-year average and 16.9% less than the previous record production of 1964.

(2) *Exports*

The total quantity (nut equivalent) of the major coconut products exported in 1969 is 906 million nuts. This is 17.9% lower than the figure for 1968, 24.4% lower than the last five-year average, and 44.5% lower than the previous record.

5. General

(1) The Biometrician was released by the Coconut Research Board to act as consultant Biometrician for the Rubber Research Institute in addition to his duties at the Coconut Research Institute.

(2) The Biometrician assisted the post-graduate students of the Vidyodaya University in their experimental work and statistical analyses of results.

(3) The Biometrician assisted the Dept. of Census and Statistics in the supervision of their officers who are now engaged in the All-Island Coconut Survey.

6. Personnel

Mr. D. Mathes was appointed Graduate Technical Assistant from 1st March 1969.

Mr. S. Wijesinghe was appointed Lab. and Field Attendant (Temp.) with effect from 9th May 1969.

V. ABEYWARDENE,
Biometrician.

Ceylon Cocon. Quart. (1970) **21**, 63-68.

REPORT OF THE CHIEF ADVISORY OFFICER (1969)

PART I — ADVISORY

During the year the Division continued to assist coconut growers by advising them on improved methods of cultivation and management practices pertaining to new planting, replanting, after-care, manuring, soil and moisture conservation, control of pests & diseases and on how fertilizer and seedlings could be purchased, under the Government fertilizer & seedlings subsidy schemes. In doing so the Division has attended to a large number of inquiries and letters, and coconut holdings (irrespective of their size) have been visited by the field staff for "on land" advice & demonstrations. The crop protection spraying unit has wherever necessary been made available free of cost to owners of coconut lands for spraying against coconut pest infestation. In addition, the Division handled two special assignments with the assistance of almost the entire field staff, who were drawn away from their respective areas of operation and who for this work devoted a considerable period of their time during the year. Owing to the time spent on these assignments the field staff were not in a position to devote their full attention to normal work in their respective ranges. One assignment was in respect of a detailed survey of coconut lands in 3 sample villages namely Wennappuwa, Thoduwawa and Panirendawa in the Chilaw District. The other was in regard to the granting of assistance offered by Government in the form of free seedlings, cash subsidy & free fertilizer to persons, in the Chilaw District whose coconut lands had been affected by the cyclone. In the case of the former the field staff were utilised, under the supervision of the Research Assistant, to carry out the enumeration and in the case of the latter the field staff, under the supervision of a District Coconut Instructor, inspected coconut plantations, in the Chilaw District, for which applications for relief had been received by the Institute.

The field staff have in carrying out "on land" advice & demonstrations, in their ranges, made 1420 visits under the following services:

(*a*)	Crop Improvement	434 visits
(*b*)	General Advice	421 visits
(*c*)	Preplanting	111 visits
(*d*)	Follow-up	19 visits
(*e*)	Fertilizer Subsidy Inspections	435 visits

The nature of assistance that has been given to owners and persons in charge of lands are given below:—

(1) *Soil Conservation*

(a) Number of holdings on which soil conservation methods have been recommended — 2205

(b) Number of holdings where demonstrations of tracing have been given — 155

(c) Extent of contour drains traced — 3809 chains

(2) *Draining of Water Logged Lands.*

(a) Number of holdings on which draining has been recommended — 268

(b) Number of holdings where drains have been traced — 33

(c) Extent of drains traced — 252 chains

(3) *Replanting.*

(a) Number of holdings where replanting has been recommended — 909

(b) Number of holdings where demonstrations of lining for underplanting have been done — 317

(c) Extent of land where lining has been done — 524 acres

(4) *New Planting.*

(a) Number of holdings on which advice on new planting has been sought — 232

(b) Number of holdings where demonstrations of lining have been given — 86

(c) Extent of land lined — 178 acres

(5) *Manuring.*

(a) Number of holdings for which recommendations on fertilizer application have been made — 4107

(6) *Husk Burying.*

Number of holdings on which husk burying has been recommended, — 2416

(7) *Cultural Operations.*

Ploughing, Harrowing

Number of holdings where recommendations of ploughing and harrowing have been made — 1261

(8) *Control of Weeds.*

Number of holdings where recommendations for the control of weeds have been made — 2494

(9) *After-Care of Seedlings.*

Number of holdings where after-care recommendations have been made — 1394

(10) *Pests and Diseases.*

Number of holdings on which recommendations on the prevention and control of pests & diseases have been made—

(*a*)	Red weevil	544
(*b*)	Black beetle	484
(*c*)	Termites	339
(*d*)	Caterpillar	36
(*e*)	Scale Insect	55
(*f*)	Grey blight	113
(*g*)	Stem bleeding	52
(*h*)	Bud rot	52
(*i*)	Magnesium deficiency	224
Other pests and diseases		120

Spraying against Coconut Scale has been carried out on 12 holdings and on one holding spraying against the spotted locust has been done.

(11) *Inter Cultivation.*

Number of holdings where recommendations on how inter-cultivation should be done, have been made — 89

Meetings, Talks & Exhibitions

The Field Staff have delivered 120 talks at 134 meetings. The Division participated in 2 National Exhibitions held in Galle and Kegalle and in 3 Agricultural Exhibitions held in Kandy, Matara and Marawila.

During the period under review the Division continued to handle the Crop Protection Unit which had been taken over by the Crop Protection Division in 1968. The Unit was operated by the Division's Field Staff and the services of the sprayers and personnel operating them have been made available free of cost where necessary for spraying plantations against pests and diseases. The cost of chemicals, labour and transport within the land was borne by the owners of the land. A total of 13,180 palms in 12 estates in Matara, Chilaw and Kurunegala Districts have been sprayed against Coconut Scale infestation and one estate in the Kurunegala District was sprayed against the Spotted Locust.

The coconut plantations in the Demonstration Centres at Pallai, Mundel Alampil and Mylambavalley were continued to be maintained. At the Pallai Demonstration Centre consisting of 31 acres, gradual removal of the old stand was continued in the replanted blocks. Of the seedlings underplanted in 1960 16% of the seedlings, and of those underplanted in 1962 4% were in bearing. The prolonged drought which prevailed at Pallai affected the young plantation seriously as a result of which 207 seedlings planted during 1967 and 1968 died.

Mundel Demonstration Centre is 15 acres in extent. In the 5 acre underplanted block, practically all the seedlings, planted in 1960 and 80% of seedlings planted in 1962 were in bearing, where the old stand had been completely removed. In the 10 acre block the old plantation was continued to be maintained and of the underplanted seedlings here 110 died as a result of drought.

10389—3

The Alampil Demonstration Centre which is 15 acres in extent, experienced a prolonged drought and strong winds. 405 seedlings planted in 1967 and 1968 died as a result. With a view to intensifying soil and moisture conservation in the land more husk pits and contour drains and bunds were prepared. Nearly all seedlings planted in 1961 and 47% of the plants planted in 1962 were in bearing. At Pallai, Mundel and Alampil watering of plants during the drought was difficult owing to the scarcity of water on the lands in these areas during the period. Nevertheless every attempt had been made to water them whenever possible.

The Mylambavalley demonstration centre is 25 acres in extent and consists of 4 blocks. Block A of 5 acres had been planted in 1964 and Block B of 5 acres in extent had been planted in 1966 and Blocks C and D both 15 acres in extent had been planted in 1968. The seedlings here have been regularly watered and mulched. Attempts to establish a leguminous cover crop on the entire land which is sandy, met with little success. However on an area of about one acre by the roadside, the cover is well established, perhaps due to the water-table in this area during the greater part of the year remaining at a satisfactory level. On the other hand, in the rest of the area where the land is at a higher level, the cover crop occurs in isolated small patches exhibiting very poor vegetative growth with much reduced leaf size and coverage. In this latter portion husk pits have been prepared with a view to determining whether the cover would grow better with wider coverage if it is established on them.

Other Work

The Field Staff carried out inspection of lands in the Chilaw District affected by the Cyclone. In addition, they assisted in the free distribution of seedlings. The above work initiated, in the latter part of 1968, was continued until December, 1969, with intermittent breaks. A summary of work done in this connection up to the end of the year is given below:

(A) **Cyclone Relief Work.**

(*a*)	Number of holdings inspected for issue of seedlings	—	1265
(*b*)	Number of seedlings issued	—	78,072
(*c*)	Number of holdings inspected in O/N. and May/June 1969 for subsidy and issue of free fertilizer	—	1264
(*d*)	Number of seedlings for which free fertilizer was issued	—	60,570
(*e*)	Total quantity of fertilizer issued	—	270 tons 8 cwts., 4 lbs.
(*f*)	Number of seedlings for which subsidy was paid	—	15,835

Of the 175 holdings where 23,820 seedlings had been issued for planting in Oct./Nov. 1968, 151 holdings for which 18,183 had been issued were considered for issue of fertilizer and payment of the cash subsidy during 1969, as the other holdings were not eligible to receiving this assistance as directed by the Board of Management.

(B) **Village Survey**

Besides the above, the field staff were utilised to carry out a detailed holding to holding survey of 3 villages namely Wennappuwa, Thoduwawa and Panirendawa in the Chilaw District.

This work commenced in April 1969 and was completed in October, 1969 though not continuously. The total number of holdings surveyed was 1679.

PART II

SUBSIDY SCHEME FOR PLANTING COCONUT IN UNECONOMIC CITRONELLA LANDS IN THE MATARA AND HAMBANTOTA DISTRICTS

Work under the above scheme of assistance continued to be carried out during the year. The field staff visited citronella lands to inspect the condition of the coconut seedlings planted on them for the purpose of recommending the payment of the annual cash subsidy of -/50 cts. per plant as well as to advise owners on after-care and proper maintenance of the plantations.

(*a*)	Total number of lands inspected by the field staff	—	2788
(*b*)	Total number of plants for which payment of annual cash subsidy has been sought for by owners of lands	—	603,115
(*c*)	Total number of plants for which payment of annual cash subsidy has been recommended	—	480,754

In addition to the above, fertilizer for application to the coconut plants has been issued free of cost, at distribution points, to participants in the scheme. The distribution was done by the field attendants on permits issued to owners of land. The distribution of fertilizer during the year was done among those persons who had planted during May/June, 1962 and October/November, 1962. The distribution was done under the supervision of a District Coconut Instructor. The position regarding the distribution is as follows:—

Distribution during May/June, 1969

(*a*)	Number of applicants to whom permits has been issued	—	2060
(*b*)	Number of applicants who took delivery of fertilizer	—	1876
(*c*)	Quantity of fertilizer distributed	—	514 tons, 6 cwts., 42 lbs.

Distribution during Oct./Nov., 1969

(*a*)	Number of applicants to whom permits has been issued	—	2274
(*b*)	Number of applicants who took delivery of fertilizer	—	2009
(*c*)	Quantity of fertilizer issued	—	864 tons, 6 cwts., 84 lbs.

Position of Staff as at 31.12.69

The staff which had hitherto been attached for work on the subsidy scheme for planting coconut in Citronella lands on a temporary basis were absorbed, as from January, into the

permanent cadre of the Advisory Division. They however continued to carry out their duties under the scheme as in previous years.

Chief Advisory Officer	—	1
Research Assistant	—	1
District Coconut Instructors	—	3
Advisory Field Officers	—	24
Clerk/Typists	—	8
Field Attendants	—	22
Office Attendants	—	3

Appointments

The following appointments were made during the year:

Miss W. T. R. Fernando and Miss W. M. P. Fernando as Clerk/Typists in December.

Messrs. D. M. J. S. Fernando, K. S. A. J. Fernando, H. S. C. Perera, J. H. L. Jayamaha, T. M. W. Peiris, A. C. Fernando, A. N. Peiris as field attendants in October and Mr. S. L. Sumanasiri as Field Attendant in November.

Resignations

Miss J. A. S. P. B. Ranasinghe resigned from her post as Clerk/Typist in June.

Messrs. E. N. Ratnam and D. P. R. N. Edirisinghe resigned from their posts as Advisory Field Officers in August and November respectively.

C. A. WICKREMASURIYA
Chief Advisory Officer
Coconut Research Institute

Ceylon Cocon. Quart. (1970) 21, 69-72.

REPORT OF THE PLANTING OFFICER (1969)

NURSERIES

Seednuts:—14 nurseries were maintained during the year and 2,496,439 seednuts were planted for issue of seedlings during the two seasons—May/June and October/November, 1969, the distribution of seednuts in the nurseries being as follows:

Nursery	*May/June 1969 season*	*Oct./Nov. 1969 season*	*Total*
1. Rathmalagara	115,050	287,685	402,735
2. Eraminigolla	35,425	60,245	95,670
3. Ibbagamuwa	100,075	286,175	386,250
4. Walpita	119,200	134,806	254,006
5. Hettipola	35,000	60,725	95,725
6. Wilpotha	58,325	328,393	386,718
7. Koggala	50,150	50,040	100,190
8. Bandirippuwa	37,550	45,000	82,550
9. Handapangala	—	126,990	126,990
10. Attavillu	—	135,000	135,000
11. Kalawewa	—	125,000	125,000
12. Kilinochchi	—	92,075	92,075
13. Alampil	—	123,030	123,030
14. Mylambavely	—	90,500	90,500
	550,775	1,945,664	2,496,439

Seedlings:—Orders were accepted during the year 1st January to 31st December, 1969 for 1,472,184 seedlings for issue during May/June and October/November, 1969 seasons. 18,551 seedlings were issued in 1969 from the balance seedlings of 1968.

The distribution by nurseries is as follows:

Nursery	*Orders issued for balance seedlings of* 1968	*Orders issued for May/June* '69	*Orders issued for Oct./Nov.* '69	*Total*
1. Rathmalagara	575	72,624	143,803	217,002
2. Hettipola	—	17,100	40,206	57,306
3. Wilpotha	1,925	34,617	190,660	227,202
4. Bandirippuwa ..	50	26,469	26,827	53,346
5. Ibbagamuwa	1,525	54,650	175,632	231,807
6. Walpita	2,378	80,305	71,183	153,866
7. Koggala	5,878	39,019	31,803	76,700
8. Eraminigolla	1,425	18,322	35,300	55,047
9. Kilinochchi	1,395	—	28,850	30,245
10. Alampil	—	—	58,483	58,483
11. Mylambavely	2,130	—	47,615	49,745
12. Handapangala ..	1,130	—	81,661	82,791
13. Attavillu	—	—	96,645	96,645
14. Kalawewa	140	—	81,859	81,999
	18,551	343,106	1,110,527	1,472,184

Summary:

Seedlings booked by	*Balance seedlings of Oct./Nov.* '68, *sold in* 1969	*May/June* '69	*Oct./Nov.* '69	*Total*
Small holders	11,526	139,901	295,383	446,810
Estate owners	3,850	152,948	391,226	548,024
Govt. Departments ..	675	775	49,319	50,769
Land Commissioner	2,500	39,955	331,380	373,835
Cyclone Relief Scheme ..	—	9,527	43,219	52,746
	18,551	343,106	1,110,527	1,472,184

Distribution of orders by Revenue Districts:

Revenue District	MAY/JUNE — 1969 *Seedlings booked by small holders*	*Seedlings booked by Estate owners*	*Seedlings booked by Govt. Depts.*	*Seedlings booked by G.A's.*	*Total*
1. Kurunegala ..	28,415	57,596	—	9,250	95,261
2. Puttalam ..	10,837	19,180	—	—	30,017
3. Chilaw	25,348	24,523	75	—	59,473
4. Colombo/Negombo	26,654	27,990	9,527	—	54,644
5. Kalutara	2,912	2,120	—	6,480	11,512
6. Galle	14,583	6,064	100	—	20,747
7. Matara	4,035	2,600	—	3,000	9,635
8. Hambantota ..	1,850	1,000	—	—	2,850
9. Kegalle	11,482	3,800	600	6,225	22,107
10. Ratnapura ..	2,595	3,175	—	15,000	20,770
11. Kandy	9,830	500	—	—	10,330
12. Matale	360	3,400	—	—	3,760
13. Nuwara Eliya ..	300	—	—	—	300
14. Badulla	700	1,000	—	—	1,700
15. Monaragala ..	—	—	—	—	—
16. Batticaloa ..	—	—	—	—	—
17. Amparai	—	—	—	—	—
18. Trincomalee ..	—	—	—	—	—
19. Anuradhapura ..	—	—	—	—	—
20. Polonnaruwa ..	—	—	—	—	—
21. Mannar	—	—	—	—	—
22. Jaffna	—	—	—	—	—
23. Vavuniya	—	—	—	—	—
	139,901	152,948	10,302	39,955	343,106

Distribution of orders by Revenue Districts:

Revenue District	OCTOBER/NOVEMBER — 1969 Seedlings booked by small holders	Seedlings booked by Estate-owners	Seedlings booked by Govt. Depts.	Seedlings booked by G.A's.	Total
1. Kurunegala ..	55,955	88,150	515	25,000	169,620
2. Puttalam ..	66,630	141,650	—	85,000	293,280
3. Chilaw	32,127	36,565	43,234	—	111,926
4. Colombo/Negombo	29,452	24,751	—	—	54,203
5. Kalutara	3,760	900	—	—	4,660
6. Galle	2,720	3,550	15	7,000	13,285
7. Matara	2,648	2,300	—	2,000	6,948
8. Hambantota ..	3,785	5,000	150	4,000	12,935
9. Kegalle	6,739	1,300	15	—	8,054
10. Ratnapura ..	9,375	4,800	—	15,810	29,985
11. Kandy	11,173	9,100	4,625	25,000	49,898
12. Matale	6,325	17,250	12,526	12,000	48,101
13. Nuwara Eliya ..	—	—	2,664	4,000	6,664
14. Badulla	3,340	1,000	14,886	25,000	44,226
15. Monaragala ..	16,035	2,000	—	28,000	46,035
16. Batticaloa ..	6,800	12,530	690	8,000	28,020
17. Amparai	1,520	2,000	5,000	8,070	16,590
18. Trincomalee ..	1,804	2,800	500	—	5,104
19. Anuradhapura ..	5,535	1,000	—	54,000	60,535
20. Polonnaruwa ..	6,610	1,500	15	—	8,125
21. Mannar	600	1,500	400	—	2,500
22. Jaffna	8,500	3,900	200	16,000	28,600
23. Vavuniya	13,950	27,680	7,103	12,500	61,233
	295,383	391,226	92,538	331,380	1,110,527

P. D. L. FERNANDO
Planting Officer.

Ceylon Cocon. Quart. (1970) **21**, 73-74.

REPORT OF THE PUBLICATIONS OFFICER (1969)

Ceylon Coconut Quarterly

Three issue of Ceylon Coconut Quarterly were published during the year, viz. Vol. XIX No. 4 and Vol. XX Nos. 1/2. Two more issues, Vol. XX No. 3 and No. 4 were sent to the press but could not be released before the end of the year.

Ceylon Coconut Planters' Review

Vol. V No. 4 of Ceylon Coconut Planters' Review was published. Vol VI No. 1 was sent to the press but could not be released before the end of the year.

Pol Pawath

Vol. IV No. 3 of Pol Pawath was sent to the press. Material for printing was sent well in advance but the journal could not be released before the end of the year owing to delay in printing.

Leaflets

Revised versions of the following leaflets were issued:—

Sinhala — Nos. 41 Bud Rot.
46 Planting Coconut in Home Gradens.

Tamil — Nos. 1 Selection of Seed Coconuts.
5 The Utilisation of Husks on Coconut Estates.
6 Coconut Shell Charcoal.
17 Cover—crops for Coconuts.
20 How to make a Barbecue
21 Planting Coconut on Old Rubber Lands.
29 Rats, Bats, Bandicoots and Porcupines—Pests on Coconut.
39 The Black Beetle Pest and its Control.
42 Leaf Blight.

English — No. 46 Planting of coconut in Home Gradens.

12 Sinhala leaflets; 6 Tamil leaflets and 13 English leaflets were reprinted during the year to maintain the stock position.

Circulation

There was a 50% increase in the demand for Advisory Leaflets during the year. An average of about 370 sets of leaflets per month were sent by post to individuals free of charge and we have issued only one set per person. These figures do not include literature distributed by Advisory Field Officers.

We are now distributing 6000 copies of each issue of Pol Pawath. A revision of the free mailing register maintained for this purpose is contemplated.

Radio Talks

19 talks in Sinhala and 9 talks in Tamil were broadcast during the year. There was a repeat broadcast of each talk in Tamil.

The talks were mainly designed to focus attention on cultural and management practices that are essential on coconut estates. There were two special talks on the working of the Coconut Board and the Coconut Coir Board.

Library

During the year under review 310 Journals have been received on subscription and on exchange and 185 new books have been acquired.

Publications—Four issues of the "Library Bulletin" have been issued during the year. Compilation of an annual "Bibliographical series" on coconut has been started.

During the year several books and journals were loaned to other libraries. We have also borrowed a number of books and journals from the Department of Agriculture, University of Ceylon (Colombo), University of Ceylon (Peradeniya) and the CISIR. We thank them for their valuable co-operation.

A. K. GUNAPALA,
Publications Officer.

Ceylon Cocon. Quart. (1970) 21, 75-77.

REPORT OF THE WELFARE OFFICER (1969)

The strength of the Staff was as follows:—

	Senior	*Intermediate*	*Assistant*	*Minor*	*Total*
At the end of 1968	5	8	125	107	245
Add—New appointments in 1969	—	—	6	10	16
	5	8	131	117	261
Less—Resignations in 1969	—	—	5	—	5
Retirements in 1969	—	—	—	1	1
Staff position as at 31.12.69	5	8	126	116	255

The cadre of the Staff at the end of 1969 was 255 as against 245 in 1968. 16 new appointments were made while there were 5 resignations and one retirement during the year. Of the 16 new appointments 9 employees were recruited internally. This excludes the promotion of an Intermediate Staff Officer of the Botany Division to the Senior Staff. Internal appointments to the Institute during the year were as follows:

From Intermediate Staff Grade to Senior Staff:

Dr. M. A. P. P. Manthriratne, Botanist, with effect from 22.10.69.

Within the Assistant Staff Grade II:

Mr. T. M. S. P. F. Gunawardena, Superintendent, I.S.G. with effect from 15.7.69.

From Minor Staff to Assistant Staff Grade II:

Mr. K. N. Rodney Fernando, Cashier Clerk with effect from 1.1.69.

From Labour Grades to the Minor Staff:

Mr. K. P. A. Fernando, Field Attendant (Pollination) Botany Division with effect from 1.8.69.
Mr. W. T. H. Clifford Fernando, Field Attendant, (Pollination) Botany Division with effect from 1.8.69.
Mr. C. A. Camilus Fernando, Attendant, Advisory Division, with effect from 1.10.69.
Mr. T. M. V. Pieris, Attendant, Advisory Division, with effect from 1.10.69.
Mr. D. M. J. Stanley Fernando, Attendant, Advisory Division with effect from 1.10.69.
Mr. J. H. Leelaratne Jayamaha, Attendant, Advisory Division, with effect from 1.10.69.
Mr. H. A. N. Pieris, Attendant, Advisory Division, with effect from 1.10.69.
Mr. H. Sonnie Christie Perera, Attendant, Advisory Division, with effect from 1.10.69.
Mr. K. S. Anthony Joseph Fernando, Attendant, Advisory Division, with effect from 1.10.69.

The following external appointments have been made during the year:—

Assistant Staff Grade I:

Mr. M. P. T. D. Mathes, Graduate Technical Assistant, Biometry Division, with effect from 1.3.69.

Assistant Staff Grade II:

Mr. P. A. Pakkiam, Technical Assistant, Soil Chemistry Division, with effect from 15.5.69.

Mr. G. Don George, Technical Assistant, Chemistry Division, with effect from 15.5.69.

Mr. R. B. C. M. W. P. Chandrasiri, Technical Assistant, Crop Protection Division, with effect from 1.6.69.

Miss W. M. Precilda Fernando, Clerk Typist, Advisory Division, with effect from 2.12.69.

Miss W. Tilaka Ranjanie Fernando, Clerk Typist, Advisory Division with effect from 2.12.69.

Minor Staff:

Mr. Sarath Wijesinghe, Temporary Field & Lab. Attendant, Biometry Division, with effect from 9.5.69.

The following officers resigned during the year:—

Assistant Staff Grade II:

Mr. E. N. Ratnam, Coconut Instructor, Advisory Division, with effect from 1.9.69.

Mr. C. P. Wickremaratna, Technical Assistant, Crop Protection Division, with effect from 1.2.69.

Mr. K. Don Anacletus, Technical Assistant, Soil Chemistry Division, with effect from 24.8.69.

Miss Padmini Chandrasena, Clerk Typist, Advisory Division, with effect from 15.6.69.

Mr. R. B. C. M. W. P. Chandrasiri, Technical Assistant, Crop Protection Division, with effect from 1.10.69.

The following officer retired from service during the year:—

Minor Staff:

Mr. P. A. Joseph Appuhamy, Estate Watcher, Bandirippuwa Estate, on 31.1.69.

Internal Audit:—The proposal to set up an Internal Audit Unit was implemented during the year with the Chief Administrative Officer, Mr. S. C. Kahawita as Chief Internal Auditor in addition to his substantive duties. Messrs. P. R. Fernando Pulle and F. Milton Silva, Clerk Typists were appointed as Internal Auditors with effect from 1.7.69. for a period of two years in the first instance.

Administration:—Mr. T. T. A. J. C. Samarasinghe, Assistant, Administrative Officer, was appointed to be in charge of the Administration.

Labour Grades:—The permanent labour force of the Institute as at 31.12.69 was as follows:—

On Monthly pay:—	27
On Daily pay:—	279

This excludes temporary gangs on daily pay and on contract basis employed on casual work. The cadre of the non-staff monthly paid category has increased in view of the privilege given to some categories of the daily paid labour force to qualify for that grade after 15 years of continuous service. This category of workers can qualify to the Minor Staff Grade after a further period of 10 years continuous service irrespective of any academic qualifications.

Workmen's Compensation:—There were 13 accidents during the year as against 21 in 1968. There were no fatal accidents. As a special privilege the Institute continues to cover the workers for the first seven "waiting days" on payment of an additional premium.

Housing:—A sum of Rs. 41,390/- has been spent in the construction of new buildings and Rs. 21,729/35 has been incurred on furniture. This excludes the extension to the Headquarters Building under construction.

2 Committee meetings have been held during the year for the allocation of quarters.

Financial Aid:—(*a*) Festival Advances of Rs. 100/- were paid to the Staff and non-staff Monthly paid employees drawing a basic salary of Rs. 300/- and below, and Rs. 50/- to the daily paid employees.

(*b*) Loans for purchase of building sites and construction of houses were granted to members during the year. Premia in respect of the Insurance Polices were also paid from the Provident Fund during the year.

(*c*) The Board contributed an equal amount to the Officers' contribution of the Medical Aid Fund. 10 Meetings were held during the year.

General:—Liaison between the Institute and its Social & Welfare Organisations were cordially maintained and every assistance was given in carrying out the establishment work of the Institute. In particular, applications and complaints regarding Provident Fund, Festival Advances, Loans, Gratuity, Insurance, Medical Aid, employment and training and other personnel work have been dealt with.

Thrift, Savings & Stores:—The C.R.I. Co-operative Welfare Society catered to the needs of its members in the supply of essential articles including foodstuffs and textiles. With the implementation of converting it to a Multipurpose Society there will be more scope to expand its business.

The Board continued to give the Annual Grant of Rs. 1500/-.

Recreational and Cultural Activities:—The Annual Christmas Party was held in December and gifts were distributed to the Members' children. The club participated in the "D" Division Govt. Service Cricket tournament and was eliminated in the second match.

Fully furnished Rest Rooms for the staff and labourers were maintained at Institute's expense.

The C.R.I. Art Circle functioned as in previous years. The Catholic Association participated in a number of pilgrimages.

Industrial Relations:—There were no industrial disputes and employer—employee relationships remained cordial during the year.

F. H. B. FELIX SILVA
Welfare Officer
Coconut Research Institute

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REPORT ON ESTATES

(I) BANDIRIPPUWA ESTATE

Acreage Statement

Area	*A*	*R*	*P*
Research	105	3	12
Estate	237	1	05
Buildings, Streams and Roads	17	0	00
Waste Land and Paddy		3	14
Play Ground	5	0	00
Total	365	3	31

Distribution of Acreage by Blocks

Block Nos.	*Research Area Experiments*		*Research*	*Estate*	*Total*
		A R P	*A R P*	*A R P*	*A R P*
1	Agro. Exp.	5 3 02	5 3 02	12 2 32	18 1 34
2	Botany Hybrid	2 3 00			
	Agro. Exp.	7 1 00	10 0 00	6 1 07	16 1 07
3	Botany Different X'5 ..	7 3 02	7 3 02	13 0 09	20 3 11
4	Botany Twin Palms ..	1 0 03			
	Botany Hybrid	3 01	1 3 04	40 1 28	42 0 32
5	Genetics 'B' Section	4 3 01			
	Variety Block	2 0 01			
	T × D Hybrid	2 2 03	9 1 05	9 2 35	19 0 00
6	Genetics 'A' Block	2 0 06	2 0 06	1 2 01	3 2 07
A	Projeny Trial	25 3 01			
	Botanists Research H. Brid ..	4 2 00			
	San Roman	3 2 01			
	Genetics 'B' Section ..	1 20	34 0 22	107 3 23	142 0 05
B	Response Curve	17 0 05	17 0 05	27 2 09	44 2 14
C	Response Curve	18 0 06	18 0 06	18 0 21	36 0 27
	Total		105 3 12	237 1 05	343 0 17

Agrostology Experiment, G.B. Genetics 'B' Section, G.A. Genetics 'A' Section R/C: Response Curve.

Census end 1969

Particulars	1	2	3	4	5	6	*BB*	*GA*	*GB*	*A*	*B*	*C*	*Total*
Full Bearing	1,005	514	838	2,143	743	145	17	395	204	5,552	3,071	2,003	16,630
Partial do	256	218	210	67	99	50		29	72	91	80	8	1,180
Duds	202	70	90	22	48	6				36	61	4	539
In Flower										145			145
With stem	25		34	1				32		292		5	389
Established Plants	128		150					10		171			459
Supplies			15	69	2		18	1		201	2		308
Total	1,616	802	1,337	2,302	892	201	35	467	276	6,488	3,214	2,020	19,650
Vacancies	102	61	77	287	111	9		47	26	1,731	447	254	3,152
Total	1,718	863	1,414	2,589	1,003	210	35	514	302	8,219	3,661	2,274	22,802

Rainfall

Comparative Rainfall 1968/69 *with respective Wet & Rainy days.*

Month	1968 *Inches*	1968 *Wet days**	1968 *Rainy days†*	1969 *Inches*	1969 *Wet days**	1969 *Rainy days†*	*Total Rainfall* 1963/1967	1963/1967 *Average Rainfall*
January ..	0.23	1		5.42	4		11.70	2.34
February ..	2.08	2		1.46	4		14.05	2.81
March ..	1.88	7	1	2.14	4	1	24.81	4.96
April ..	9.14	14		8.16	15	1	28.31	5.66
May ..	2.50	7	1	13.59	23		53.40	10.68
June ..	11.60	20	1	3.11	12		26.00	5.20
July ..	10.01	13		0.48	4		17.57	3.51
August ..	0.30	2	1	4.47	13		22.62	4.52
September ..	3.52	13		0.55	6	2	52.78	10.55
October ..	11.49	19		15.28	22		79.79	15.96
November ..	12.09	12	1	5.13	12		44.73	8.94
December ..	1.44	4		13.80	16	1	23.75	4.75
Total	66.28	114	5	73.59	135	5	399.51	79.88

*0.04" and above

†0.01" to 0.04"

Crops

Total Crop from 1965 to 1969 with the respective Averages.

	1965	1966	1967	1968	1969	*Averages*	*Crop per (averages) Bearing palms*
1st Crop	142,741	89,966	120,536	170,066	105,366	125,737	5.9
2nd Crop	218,317	134,782	215,545	172,374	177,849	148,203	10.0
3rd Crop	268,827	247,774	235,398	243,038	216,126	199,007	12.1
4th Crop	254,697	239,604	161,286	215,977	189,375	174,312	9.8
5th Crop	182,795	132,914	178,888	102,517	104,043	140,231	5.8
6th Crop	120,655	92,468	191,825	76,920	89,417	114,257	5.0
Total	1,188,032	937,508	1,103,478	980,892	882,176	1,018,417	49.5

Disposal of Crops (6 Crops 1969)

Sold on contract	253,798	
Sold to Research	3,341	
Sold to Staff	536	
Sold to Planting Division	128,550	
Nursery	4,709	
Converted into copra	454,893	
Nut Allowance to staff	22,063	
Empties	14,286	1.62%
Total	882,176	

454,893 nuts were turned into copra weighing 328 candies—040 lbs. with an out turn of 1,386 nuts per candy. The percentage of nuts per candy was high due to the fact that nuts converted into copra were the left overs from the nuts sold to the contracters and to the Planting officer. The percentage of No. 1 copra was 85.6%.

Field Notes

The following field works have been carried out during the year.

Weeding

Weeds have been effectively controlled on the estate. On a Board's decision the complete weeding of the estate was suspended and this job of work was handed over to the Agrostologist's Division for establishing grasses under coconut from the month of December 1969.

Drains

All old drains have been maintained in good order.

Pests & Diseases

There were a few cases of black beetle and red weevil attacks on palms, but the pest was kept under control by adopting required control measures.

Manuring

Palms on the estate section was manured with a mixture containing equal propotions of Sulphate of Ammonia, Saphos phosphate and Muriate of Potash 60%—at the rate of 8 lbs. per palm, the manure was applied in full circles and forked in. The palms in the Research Section were manured as per experimental requirements.

H. A. RANASINGHE
Superintendent
Bandirippuwa Estate.

(II) RATHMALAGARA ESTATE, MADAMPE

Acreage Statement

Area	*Acre*	*Roods*	*Perches*
Research Section	156	0	0
Estate Section	80	0	0
Roads & Buildings	5	0	0
Jungle & Waste Lands	19	0	0
Nurseries	13	0	0
	273	0	0

Distribution of Acreage by Blocks

Botanist Div. Experiments	38	2	0	(Approximately)
Soil Chemist Div. ,, ...	63	0	0	,,
Agrostology Div. ,, ...	52	0	0	,,
Biometry Div. ,, ...	2	2	0	,,
Estate Planted area	80	0	0	,,
Roads & Buildings	5	0	0	
Jungle & Waste Land	19	0	0	
Planting Div. Nurseries	13	0	0	
	273	0	0	

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Census of Palms

Particulars	*Bk* 1	*Bk* 2	*Bk* 3	*Bk* 4	*Bk* 5	*Bk* 6	*Bk* 7	*Bk* 8	*B/B*	*Total*
Full Bearing	1,555	230	755	1,359	1,171	1,575	2,532	333	2,721	12,231
In Flower	1	—	—	26	—	4	31	8	6	76
Young Palms	47	—	15	85	—	2	200	2	262	613
Duds	20	6	19	11	—	40	11	4	—	111
Vacancies	8	4	35	42	—	58	20	8	146	321
	1,631	240	824	1,523	1,171	1,679	2,794	355	3,135	13,352

B/B = Botanist Blocks

Comperative Rainfall 1968/1969 with respective Wet days*

Month	1968 *Ins.*	*Wet days*	1969 *Ins.*	*Wet days*	*Total* 1963/67	*Average* 1963/67
January ..	0.67	3	1.70	6	7.74	1.55
February ..	0.02	1	1.67	3	4.67	0.93
March ..	3.02	9	—	—	21.29	4.26
April ..	13.78	18	9.17	15	25.10	5.02
May ..	0.43	5	7.00	17	28.51	5.70
June ..	10.18	22	1.77	10	15.42	3.09
July ..	6.18	13	0.30	1	16.49	3.30
August ..	0.04	1	2.88	13	8.32	1.66
September ..	2.87	13	0.75	3	27.18	5.44
October ..	10.30	18	15.30	23	69.20	13.84
November ..	9.84	14	4.14	9	50.32	10.06
December ..	4.46	12	9.99	19	24.16	4.83
Total	61.79	129	54.67	119	298.40	59.68

*(Wet Day—Rainfall of 0.04" and above)

Crops

	Total Crops from 1965 *to* 1969				
	1965	1966	1967	1968	1969
1st Pick	98,290	65,484	88,477	127,455	144,718
2nd Pick	162,689	122,472	132,262	152,715	197,352
3rd Pick	162,985	161,622	97,159	130,223	192,682
4th Pick	175,467	158,336	88,310	131,400	149,919
5th Pick	132,521	69,589	102,736	94,000	83,622
6th Pick	62,039	59,963	117,873	75,276	63,099
	793,991	637,466	626,817	711,067	831,392*

*Highest crop recorded to date.

Disposal of Crops (5 Crops only) as at 31.12.69

Picked to-date (5 Crops)	768,293	nuts
Cured into copra	423,856	,,
Sold on Contract	157,444	,,
Sold to Planting Div.	42,855	,,
Sold to Research Div.	2,224	,,
Allowance to Staff/Labour	9,476	,,
Others	1,109	,,
Rejections	16,916	,,
Balance	114,413	,,

Copra:—The 423,856 nuts converted into copra gave 281 Candys 466 lbs. of all three grades, the percentages being No. 1 copra — 79.31%
No. 2 copra — 19.64%
No. 3 copra — 1.05%

The copra out-turn has worked at 1503 nuts per candy. The out-turn is rather high owing to the fact the nuts cured were those left over after the best nuts were sold to the Planting Division, Sold on Contract, and included copra from the Dwarf plantation which by itself has an out-turn of around 3550 nuts per candy.

Field Works

The following Field Works have been carried out in the Estate Section.

Weeding	214 acres
Clearing/deepening drains	2,695 fathoms
Road repairs	265 ,,
Boundary fence repairs	1,292 ,,
Manuring	4,617 palms
Disc harrowing	40 acres
Mulching	3,177 palms

Buildings

All buildings within the Research Station have been well maintained.

S. T. BRAINE
Superintendent
Rathmalagara Estate,
Madampe.