

# CEYLON COCONUT QUARTERLY

Volume XX

January—June 1969

No. 1/2

---

## CONTENTS

	Page
1. REPORT OF THE CHAIRMAN ... ..	5
2. REPORT OF THE DIRECTOR ... ..	7
3. REPORT OF THE OFFICER-IN-CHARGE, CHEMISTRY DIVISION ... ..	17
4. REPORT OF THE OFFICER-IN-CHARGE, BOTANY DIVISION ... ..	43
5. REPORT OF THE ACTING SOIL CHEMIST ... ..	45
6. REPORT OF THE OFFICER-IN-CHARGE, AGROSTOLOGY DIVISION ... ..	67
7. REPORT OF THE CROP PROTECTION OFFICER ... ..	80
8. REPORT OF THE BIOMETRICIAN ... ..	84
9. REPORT OF THE CHIEF ADVISORY OFFICER ... ..	86
10. REPORT OF THE PLANTING OFFICER ... ..	91
11. REPORT OF THE PUBLICATIONS OFFICER ... ..	95
12. REPORT OF THE WELFARE OFFICER ... ..	97
13. REPORT ON ESTATES :	
(i) Bandirippuwa Estate ... ..	99
(ii) Ratmalagara Estate ... ..	102

**Price :**

Local : Rs. 2.50  
Overseas : 10sh. 6d.

**Annual Subscriptions**

Local : Rs. 4.50  
Overseas : 21sh.

# REPORT OF THE CHAIRMAN

## for the year 1968

On 1st January 1968, the Coconut Research Board consisted of the following :

*Ex-Officio Members :*

- Mr. M. S. PERERA,  
Director of Agriculture
- Mr. C. A. COOREY,  
Treasury Representative
- Mr. C. CHANMUGAM,  
Commissioner of Coconut Rehabilitation.
- Mr. T. C. A. de SOYSA,  
Chairman, Low Country Products Association.
- Dr. W. R. N. NATHANAEL,  
Director, Coconut Research Institute.

*Nominated by the Hon'ble Minister of Agriculture & Food from Senate & Members of Parliament*

- Mr. J. L. SIRISENA, M.P.  
Mr. FESTUS PERERA, M.P.

*Nominated by the Planters' Association of Ceylon.*

- Mr. C. T. VAN GEYZEL, J.P. &  
Mr. B. WARUSAVITHARNE.

*Nominated by the Low Country Products Association.*

- Mr. C. A. M. de SILVA, &  
Mr. H. M. A. B. FERNANDO.

*Nominated by the Hon'ble Minister of Agriculture & Food to represent Small Holders.*

- Mr. M. M. KUMARAKULASINGHAM, &  
Mr. W. JAYAKODDY.

*Secretary to the Board.*

- Mr. S. C. KAHAWITA

On 23.10.1968, the Hon'ble Minister nominated Mr. S. B. Silva to represent the Small-holders in place of Mr. W. Jayakoddy.

On 1.11.1968 Mr. R. H. de Mel was nominated by the Low Country Products Association in place of Mr. C. A. M. de Silva.

## **MEETINGS :**

Five meetings of the Coconut Research Board, 219th, 220th, 221st 222nd and 223rd were held on 28th January, 20th March, 13th June, 5th September and 17th December, respectively.

A special meeting of the Coconut Research Board was held on 3rd November, 1968 to elect a Chairman and Mr. R. H. de Mel was unanimously elected as Chairman, Coconut Research Board.

## **COMMITTEES :**

### **ADMINISTRATIVE COMMITTEE (as at 1st January 1968).**

1. Mr. C. A. M. de SILVA (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 59th, 60th and 61st meetings of the Administrative Committee were held on 12th February, 20th July and 26th November, respectively.

### **ESTATES AND EXPERIMENTAL COMMITTEE (as at 1st January 1968)**

1. Mr. M. M. KUMARAKULASINGHAM (Chairman)
2. Mr T. C. A. de SOYSA,
3. Mr. M. S. PERERA,
4. Mr. B. WARUSAVITHARNE,
5. Mr. C. A. M. de SILVA,
6. Mr. C. T. VAN GEYZEL,
7. Mr. J. L. SIRISENA, M.P.,
8. Mr. W. JAYAKODDY,
9. Dr. W. R. N. NATHANAEL.

The 63rd, 64th, 65th and 66th meetings of the Estates and Experimental Committee were held on 17th February, 22nd May, 14th August and 18th November, respectively.

### **EXTENSION COMMITTEE (as at 1st January, 1968)**

1. Mr C. T. VAN GEYZEL (Chairman)
2. Mr. T. C. A. de SOYSA,
3. Mr. C. A. M. de SILVA,
4. Mr. C. CHANMUGAM,
5. Mr. M. M. KUMARAKULASINGHAM,
6. Mr. W. JAYAKODDY
7. Dr. W. R. N. NATHANAEL.

The 49th, 50th and 51st meetings of the Extension Committee were held on 25th April, 29th August, and 11th November, respectively.

### **EDITORIAL COMMITTEE (as at 1st January, 1968)**

1. Mr. M. M. KUMARAKULASINGHAM, (Chairman)
2. Dr. W. R. N. NATHANAEL,
3. Mr. C. A. WICKREMASURIYA,
4. Mr. D. E. SCHOKMAN.
5. Mr. A. K. GUNAPALA, (Secretary)

The 18th and 19th meetings of the Editorial Committee were held on 28th August, 1968 and 15th December, 1968 respectively.

C. A. M. de SILVA  
Chairman  
Coconut Research Board.

# REPORT OF THE DIRECTOR for the year 1968

## STAFF

The Staff of the Coconut Research Institute as at 1st January 1968, was as follows:—

### ADMINISTRATION DIVISION

Director ... .. Dr. W. R. N. NATHANEAL, 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 Secretary ... .. Mr. T. T. A. J. C. SAMARASINGHE, LL.B. (Cey.).

### CHEMISTRY DIVISION

Officer-in-charge & Senior Technical Assistant ... Mr. M. JEGANATHAN, B.Sc. (Lond.).

### BOTANY DIVISION

Research Assistant ... .. Mr. M. A. P. MANTHRIRATNE, B.Sc. (Lond.)  
(On Overseas Post-graduate training since 4.10.65).  
Officer-in-charge ... .. Mr. R. B. RODRIGO.

### 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 & Research Assistant ... .. Mr. T. S. BALAKRISHNAMURTI, B.Sc. (Lond.), M.Sc. (Aberdeen).

### AGROSTOLOGY DIVISION

Research Assistant ... .. Mrs. N. RAJARATNAM, B.Sc. Hons. (Cey.),  
(On Overseas Post-graduate training since 27.9.66).  
Officer-in-charge & Senior Technical Assistant ... Mr. D. E. F. FERDINANDEZ, B.Sc. (Lond.).

### CROP PROTECTION DIVISION

Crop Protection Officer ... .. Dr. U. B. M. EKANAYAKE, B.Sc. Hons. (Cey.), D.Phil. (Oxon)

### BIOMETRICS UNIT

Biometrician ... .. Mr. V. ABEYWARDENA.

### 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 & LIBRARY

Publications Officer ... .. Mr. A. K. GUNAPALA, B. A (Cey.)

## GENERAL

1. Dr. U. B. M. Ekanayake, Crop Protection Officer, and Mr. V. Abeywardena, Biometrician, attended the Third Session of the F. A. O. Technical Working Party on Coconut Production, Protection and Processing, held in Jogjakarta, Indonesia, from 9-19th September, 1968, and presented papers.

2. 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, reported on the progress of work in the Division of Soil Chemistry, whilst on leave in Ceylon during August/September; and also addressed the Low Country Products' Association on the New C.R.I. Fertilizer Recommendations.

3. Mr. M. A. T. de Silva, Senior Technical Assistant, who completed a year's training at the Long Ashton Research Station, Bristol, was given a period of six months' extension by the Coconut Research Board to complete his studies for the M.Sc. Degree.

4. Reports regarding the favourable progress of the Research Assistants in Botany and Agrostology, who continued to be away on overseas training, have been received during the period under review.

### Coconut Crops

Since the coconut industry of Ceylon depends largely on overseas markets, its prosperity naturally ebbs and flows according to the supply of and demand for coconut oil and other coconut products in the world markets. The continued success of the industry therefore depends not only on its ability to surmount agricultural and economic difficulties but also on its ability to withstand competition from other producing countries. In view of these facts it is imperative that apart from increasing coconut yields (to reduce the cost of production), the quality of coconut products should also be maintained at a higher level.

An all-time record in coconut production estimated at 3,148 million nuts was recorded in 1964. The estimated production for 1968 is 2,764 million nuts representing a decrease of 12.2% from 1964 and 0.5% from the average production (of 2,777 million nuts) for the past 5 years. The production figure for 1968 however constitutes an increase of 7.3% over the preceding year, which has been estimated at 2,577 million nuts. If not for the fact that some of the most productive estates and small holdings in the Chilaw District (constituting an area equivalent to about 9% of the Island's coconut acreage) suffered extensive damage during the October 1967 cyclone, the Island production for 1968 would in all probability have exceeded the average for the past 5 years.

The reflection of the increase in production in 1968 (over the preceding year) on the volume of exports amounts to 16.0%. In terms of the record and the average for the past 5 years however the exports are lower by 32.2% and 9.6% respectively.

As regards the value of exports, 1968 has been an exceptionally good year, registering a new record for the average amounting to Rs. 302/62 per 1,000 nuts. This figure actually represents an increase of 69.2% over 1967 and 63.6% over the average for the last 5 years. In terms of the previous record of Rs. 258/29 reached in 1961, the increase is 17.2%.

### VISITORS

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

Dr. D. H. Constable, Ceylon Fertilizer Project (F.A.O.)  
Dr. A. Gazelbash, ECAFE.  
Dr. D. G. Coursey, Tropical Products Institute, London.  
Dr. C. G. Manuel, ECAFE, Bangkok.  
Prof. J. D. Ferwerda, University of Wageningen.  
Mr. A. H. Green, Agronomist, Unilever, London.

Dr. B. E. Grimwood, Tropical Products Institute, London.  
Mr. H. J. Stanley, Dar-es-Salaam, Tanzania.  
Mr. C. G. Akhurst, World Bank, Washington.  
Dr. M. E. Raymundo, University of Philippines.  
Dr. G. G. Etchholz, I.A.E.A., Vienna.  
Prof. E. J. H. Corner, University of Cambridge, U.K.  
Dr. L. Hartman, D.S.I.R., New Zealand.

## PUBLICATIONS

Articles entitled "Coconuts in 1968" and "Activities of the Coconut Research Institute in 1968" were contributed to the Annual Report of the Planters' Association of Ceylon.

Three issues of the Ceylon Coconut Quarterly (Vol. XVIII No : 3/4, Vol. XIX No. 1/2 and Vol. XIX No. 3) were released during the year.

Two issues of the Ceylon Coconut Planters' Review (Vol. V No. 2 and Vol. V No. 3) were released during the year.

Vol. IV No. 2 of the Sinhala Journal "Pol Pawath" was published.

## STAFF RESEARCH CONFERENCES

Following the series of staff research conferences started in 1966, four conferences were held during the year at quarterly intervals as follows :-

Quarter	Date	Discussion led by	Subject
First	29.3.68	Mr. A. K. Gunapala (Publications Officer)	"The role of mass media in the dissemination of Information."
Second	29.6.68	Dr. U. B. M. Ekanayake (Crop Protection Officer)	"Regulation of Insect Populations".
Third	27.9.68	Mr. T. S. Balakrishnamurti (Acting Soil Chemist)	"Fertilizer Placement Studies using Radio Isotopes".
Fourth	20.12.68	Dr. D. V. Liyanage (FAO Project Leader, Tonga)	"Coconut Cultivation in the South Pacific Islands".

## 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. CHEMISTRY DIVISION

#### 1. Coir Technology

In continuation of the work commenced earlier, some experiments were conducted on the recovery of coir fibre using the "Dry Decorticator". Unlike the technique of "Drum Processing", in this process one grade of fibre, viz., 'mattress' is recovered. A further difference is that the husks used are not retted but merely soaked for a few hours prior to milling.

#### 2. Studies on the Coconut Endosperm

Chemical studies on the coconut kernel were continued during the year. The early developmental stages of the endosperm were examined for protein and the major mineral elements, to establish the presence of concentration gradients in different regions of the kernel.

#### 3. 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 of arrack.

#### 4. Pot Culture Experiment

The chemical examination of plant samples prepared from the previous pot culture experiments were continued.

The eighth sand pot-culture experiment on 252 seedlings laid down on 20th March 1968 to study the pattern of nutrient distribution in the leaves (by rank) for seven treatments (+ ALL,—ALL,—N,—P,—K,—Ca and —Mg) using the "Leaf-punch" technique was continued during the year.

#### 5. Germination Experiment

Studies on the uptake and distribution of macronutrients during the germination and early growth stages of the coconut that has been in progress for some time, were concluded during the year.

#### 6. Coconut Varieties

Samples of copra prepared by the Division of Botany from Coconut cultivars grown in Ceylon were examined and reported on for oil content. This work is being continued.

### II. BOTANY DIVISION

#### 1. Field Experiments

All the field experiments and observation plots at Bandirippuwa (13), Rathmalagara (5) Walpita (1) and Pothukulama (9), were maintained throughout the year.

#### 2. Hybridization Work

Controlled pollination work for the production of (Tall x Tall) and (Tall x Dwarf) seed-material was continued at the Isolated Seed Garden and the following six estates :—

Bandirippuwa Estate,	...	Lunuwila
Ratmalagara Estate,	...	Madampe
Marandawila Estate,	...	Bingiriya
Achchithotam Estate,	...	Mundel
Andigedera Estate,	...	Weerapokuna
Kiniyama Estate,	...	Weerapokuna

From the above seven stations 19,208 (Tall x Tall), 27,991 (Dwarf x Tall) and 4,646 (Tall x Dwarf) seednuts were harvested during the year.

In all 7,717 (Tall x Tall), 6,049 (Dwarf x Tall) and 125 open pollinated seedlings were issued to the industry by the Division.

Assistance in the form of palm selection, training of pollinators, supervisory checks and supply of pollen was given to 17 private estates to carry out their own controlled pollination work.

#### 3. Mother Palm Seed Supply

1,604,847 mother palm seednuts were supplied to the Planting Division during the year. The Staff of the Botany Division also assisted six estate owners in selecting mother palms for raising their own planting material.

#### 4. Isolated Seed Garden

5,000 Teak seedlings obtained from the Forest Department, were planted in that portion of the isolation barrier which was previously occupied by squatters. The Seed Garden and the barrier were maintained in good order throughout the year.

### III. SOIL CHEMISTRY DIVISION

#### A. Field Experiments

1. The long-term field experiments (twelve) at Bandirippuwa, Ratmalagara, Pothukulama, Bingiriya, Walahapitiya, Mawatte, Naiwala, and Rathgama were continued.

2. The first differential manuring of the 5 x 5 x 5B Zn S Experiment at Rathgama was done in early 1968.

3. The observation trials on "Leaf Scorch" at Kirimetiya, yellowing of leaves at Iranaville, and immature nut-fall at Palugaswetiya were continued.

4. In the programme of isotope studies on efficiency of fertilizer utilization by coconut palms two experiments were completed in the field.

5. Field Experimental Results of interest are :—

(i) Placement and Liming Experiment (Walahapitiya) : For the first time since the inception of the experiment the response to the higher level of manuring ( $F_2$ ) was found superior to that of the lower level ( $F_1$ ).

(ii) Experiment on Nitrogen Quality (Mawatte) : On a lateritic gravel soil the results to date indicate that urea is as efficient a source of nitrogen as ammonium sulphate.

(iii) Radioactive Isotopes—Studies showed that the zone of highest density of active roots lies within a distance of a metre from the palm and above a depth of 45 centimetres.

#### B. Laboratory Investigations

1. Soil Analysis—(i) Total carbon, total ammoniacal and nitrate nitrogen were determined on Iranaville soils.

(ii) Total nitrogen, total carbon and available phosphorus (Obsen's) were determined on the samples from the radioisotope experiment.

2. Leaf Analysis—The following estimations were done;

(i) N,P,K, Ca and Mg on samples from the Response Curve Experiment at Bandirippuwa Estate.

(ii) N.P.K. on samples from the Naiwala Experiment.

(iii) B and Na on samples from the Response Curve Experiment at Bandirippuwa.

3. Radioisotope experiment—Radioactive counts on the leaf samples from the two experiments were carried out.

#### C. Soil Survey

The main project for the year was the survey of the Eastern Province. The Batticaloa, Kalkudah and Kalmunai Sheets were completed and the Tirukkivil Sheet commenced.

At the request of the Crop Protection Officer of the Institute a detailed soil survey of Sirikandura, Kirimetiya, Kahatapitiya and Ginigalmelyana Estates in the Ambalangoda 1" sheet was carried out.

At the request of the Government Agents of Moneragala and Jaffna Districts reconnaissance Surveys were conducted to determine the suitability of lands in the district for the cultivation of coconuts.

Surveys of tea and/or rubber estates in Rakwana, Kegalle, Baddegama and Passara were conducted to advise on the suitability of planting coconuts.

#### **IV. AGROSTOLOGY DIVISION**

##### **1. Soil Fertility Studies**

Studies on the nutrient status of the Attavillu series of soils in the Puttalam District were commenced this year. Experiments set up with the Kiulkele component of this series have been completed and the data are being studied.

Experiments set up to determine the optimum requirements of the deficient nutrients of the lateritic gravel at Hanwella were completed during the year. The data are being written up for publication.

##### **2. Pasture Studies**

All pasture-coconut competition studies were managed to schedule. A new experiment to study the effect of management of a pasture of *B. brizantha* on the yields of coconut was laid down at Ratmalagara Estate.

Evaluation studies of introduced pasture species were commenced during the year. Of the introduced species *B. ruziziensis* appears to be promising. This species was studied in detail in a pot experiment. A large number of legumes and grasses were introduced during the year and were planted in small plots for observation.

##### **3. Pasture Analysis**

All these years, due to lack of facilities for chemical analysis all management studies of pasture and fodder grasses were restricted to the quantitative aspects only. With the setting up of a unit for nitrogen estimation during the year, qualitative studies of pastures and fodder grasses were undertaken.

##### **4. Subsidiary Food Crops**

Studies on Subsidiary food crops under coconut were continued during the year, with emphasis on ground nuts and sweet potatoes.

##### **5. Cattle**

Milk production during the year was satisfactory. The entire herd was tested for T.B. and Brucellosis during the year and found to be free from both diseases. 3 Jersey bull calves were bought from the Department of Agriculture to be used as stud bulls. There were 87 births in the herd during the year.

## V. CROP PROTECTION DIVISION

### A. Pests

#### 1. Coconut Caterpillar *Nephantis serinopa* Meyr.

The biological control programme was continued. The information available from the inception of the programme is being analysed and methods of interpreting results are being developed.

On the basis of the tentative results obtained, the release of parasites in affected estates have been modified. The parasites were bred in the insectaries in Lunuwila and Mylambavelly and released in affected estates.

Evaluation of parasite liberations were carried out on four estates in the Eastern Province, four estates in the North Western Province and one estate in the Western Province. In estates North of Batticaloa the pest population densities appear to be decreasing. The same pattern is found in the estates in the North Western, and Western Provinces. However, in some estates South of Batticaloa the densities of the host populations seem to be increasing. These patterns of fluctuations of the host population densities will be discussed at length in the Annual Report.

#### 2. Rhinoceros Beetle, *Oryctes rhinoceros* L.

A large number of palms were uprooted during the cyclone of 1967 in the Chilaw and Puttalam Districts. These have not been completely removed from the holdings. Consequently, this situation has led to an increase of Rhinoceros Beetle damage.

An ecological survey was begun to determine the population densities of the Rhinoceros beetle and the insect co-inhabitants, parasites and predators of the pest.

*Platymerus levicollis*, a predator of the Rhinoceros beetle was imported from W. Samoa and is being maintained in the laboratory. It is hoped to release this predator in selected areas in which the Rhinoceros beetle is prevalent.

*Metarrhizium anisopliae*, causing a fungal disease was found to occur extensively in certain areas.

#### 3. Red Weevil, *Ryncophorus ferrugineus* F.—

An ecological survey of the Red Weevil was begun in the hope of assessing the population densities of its insect co-inhabitants.

Studies on the habits, morphology, etc., are being carried out.

### 4. Other Pests

#### 1. Nettle Grub, *Parasa lepida* Cram.—

Sporadic outbreaks of Nettle Grub occurred in the Chilaw district. Studies on the parasite-predator complex of the pest were started in collaboration with Mr. M. B. Wickremasinghe, Asst. Lecturer of the Department of Zoology, University of Ceylon, Colombo.

#### 2. Coconut Scale, *Aspidiotus destructor*:—

The Coconut Scale population appeared to increase in the Chilaw district towards the end of the year.

## **B. DISEASES**

### **1. Leaf Scorch**

Detailed studies on root growth of diseased and healthy palms were begun. With the help of the Soil Survey Unit a detailed soil survey of the Leaf Scorch affected area in the Southern Province is being carried out in order to determine the associations, if any, between soil types and the incidence of the disease. Details of this work will be published elsewhere.

## **VI. BIOMETRY**

### **1. Statistical Service**

Routine analyses of the experimental data of the Research Divisions of the Institute were carried out.

### **2. Biometrical Studies**

- (i) **Crop Forecasting**—Studies on the relationship between rainfall and crop variations were commenced during the year. The first study in the series using the crops and rainfall of Bandirippuwa Estate has yielded encouraging results.
- (ii) **Calibration Trial**—The recordings of the calibration trial at Ratmalagara Estate continued as per schedule.

### **3. Agri-Meteorology**

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

## **VII. ADVISORY DIVISION**

### **1. Advisory Visits**

(a) During the year 7,699 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 inspections under the Fertilizer Subsidy Scheme.

(b) 18,323 holdings in all were visited in connection with general advisory work. 2,282 holdings were visited for advice and demonstrations in connection with pests and diseases.

(c) The field staff delivered 158 talks at 175 meetings attended in their ranges. The Division participated in three Agricultural exhibitions held in Mapalana, Kurunegala and Horana.

### **2. Demonstration Centres**

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

### **3. Citronella Subsidy Scheme**

The main items of work for the year under this Scheme comprised inspection of lands for the payment of cash subsidy and the issue of free fertilizer. Fertilizer was distributed to applicants who had obtained their initial allocations during the planting seasons October/November, 1960, May/June, 1961, Oct./Nov. 1961, May/June, 1963, and Oct./Nov. 1963,

The particulars regarding fertilizer issues during the year were as follows :

Number of applicants to whom permits were issued	3895
Number of applicants who took delivery of fertilizer	3757
Quantity of fertilizer issued	2335 tons, 3 cwts. 14 lbs.

#### 4. Miscellaneous Work

(1) During the early part of the year, the field staff of the Division, under the guidance of the Biometrician, took part in the sample Survey of the coconut lands in the Chilaw district that were affected by the cyclone of October 1967.

(2) During December 1968, some of the Field officers were engaged in the distribution of seedlings to applicants in the cyclone affected areas of the Chilaw district. Actually, under this scheme 18,183 seedlings were delivered free of transport cost to 151 applicants.

### VIII. PLANTING DIVISION

#### 1. Seed-Nuts

The Planting Division maintained 13 nurseries during the year. A total of 2,176,623 seed-nuts were planted for issue of seedlings in the May/June and October/November seasons. 601,919 seed-nuts were planted for issue of seedlings in May/June and 1,574,707 seed-nuts for October/November.

#### 2. Seedlings

A total of 1,518,868 seedlings were booked for the two planting seasons as follows :

	Number
May/June, 1968	397,726
October/November, 1968	1,121,142
Total .	<u>1,518,868</u>

In addition to the above, 66,220 balance seedlings from the October/November, 1967 season were also issued during the early part of the year.

### IX. PUBLICATIONS UNIT AND LIBRARY

#### 1. Journals

The following issues of the C.R.I. journals were published during the year :

- (a) Ceylon Coconut Quarterly  
Vol. XVIII, No. 3/4.  
Vol. XIX, No. 1/2, and 3. No. 4 was sent to the press.
- (b) Ceylon Coconut Planters' Review  
Vol. V, Nos. 2 and 3. No. 4 was sent to the press.
- (c) Pol Pawath Vol. IV No. 2.

## **2. Advisory Leaflets**

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

## **3. Radio Programmes**

18 talks of 15 minutes duration in Sinhala and 12 talks of 15 minutes in Tamil were broadcast during the year. There was one repeat broadcast of each talk in Tamil.

## **4. Library Bulletin**

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

**W. R. N. NATHANAEL**  
*Director.*  
Coconut Research Institute.

## REPORT OF THE OFFICER-IN-CHARGE CHEMISTRY DIVISION—for the year 1968

### I. COIR TECHNOLOGY

In continuation of the work commenced earlier, some quantitative trials were carried out in order to study the efficiency of the power driven "Dry Decorticator" for the processing of coir fibre. The results of the work done on the traditional "Fibre Drum" have been recorded in the Annual Report for 1967.

Whilst "Drum Processing" yields two grades of fibre, viz., "bristle" and "mattress", only the latter grade can be recovered with the "Dry Decorticator". A further difference is that the husks used for dry decortication are not retted but merely soaked for a few hours prior to milling.

The "Dry-Decorticator". This machine consists of two parts connected by a duct of square cross-section. It is started when a sufficient number of husks have been separated into segments. The operator feeds the segments at the rate of one segment or two every second. The husk segments, when fed into the first chamber are burst by a beater-cross revolving at high speed. The shattered husk passes into the second chamber in which steel spikes of about two feet are fixed in rows to a central axle revolving at speed. The fibre dust passes out through a sieve plate and the fibre proper is blown out separately at one end. This is collected and spread out in a layer about a foot in thickness. Water is sprinkled over it and the fibre fed into the machine a second time for thorough cleaning. The second milling removes a further quantity of dust. Sun-drying of the recovered fibre is very similar to drying of "mattress fibre" recovered from "drum" processing.

The "decorticated fibre" produced in this process is generally more durable than fibre recovered from retted husks on account of the fact that the raw material has not been soaked in water for protracted periods or subjected to bacterial action. It is usually made into curled ropes either by hand or machine and resold as "Curled Decorticated Fibre" which is a raw material in rubberised coir manufacture.

**Experimental Procedure.** For the purpose of the present experiment one thousand average size husks (removed from coconuts about two weeks earlier) were drawn at random from the husk heaps. They were weighed in the air-dry state and were then submerged in water for a period of two hours. After draining off the surplus water for about 15 minutes, the husks were weighed again. They were then separated into segments and fed into the decorticator at the rate of about one or two every second. The fibre and dust being separately delivered by the machine, they were weighed by instalments at intervals. After the first milling, which was complete in about half an hour, all the fibre and dust recovered were bulked separately and mixed thoroughly before drawing samples for moisture determinations.

Prior to the second milling, the recovered fibre was spread out on the floor to a thickness of about one foot and water was sprinkled over it. The re-moistened fibre was then milled a second time—the operation lasting approximately 45 minutes. The resultant fibre was then dried (as in normal factory procedure) for a continuous period of seven hours in the sun. The sun-dry material was then weighed as "air-dry" fibre. Moisture contents of all the components were determined at each progressive stage by quadruplicate sampling. In all, six lots of 1000 husks each were processed for the purpose of the experiment. The complete data obtained in the study are charted in Tables I to VI.

The overall findings indicate that the dry matter in the husks gets distributed as follows during "Decorticator Processing" :

	Per cent
Mattress Fibre	56.5
Fibre Dust (Composite)	43.5
	<hr/>
	100.0
	<hr/>

**TABLE I**

**Moisture Contents of the Components of the Unretted Husk relevant to the Experiment ("DECORTICATOR")  
Processing  
(PER CENT)**

1	2	3	4		5		6	
BATCH	Original Husks before Soaking (Calc.)	Soaked husks (corrected for dryage during first milling)	AFTER FIRST MILLING		AFTER SECOND MILLING*		AFTER SUN-DRYING †	
			Mattress Fibre	Dust	Mattress Fibre	Dust	Mattress Fibre	Dust
I	48.5	69.7	53.1	77.6	44.3	62.2	11.0	From Separate Experiment (Mean of Six)
II	41.8	66.7	47.0	75.1	36.4	76.3	11.2	
III	39.7	65.9	54.2	77.5	50.5	73.5	11.3	
IV	49.7	67.9	55.3	77.7	52.9	72.1	11.1	
V	42.5	64.1	45.8	73.3	54.3	74.8	12.3	
VI	41.6	67.1	52.0	78.6	51.5	73.0	13.6	
Mean (6)	44.0	67.0	51.2	76.6	48.3	72.0	11.8	11.7
C.V. (%)	8.5	2.6	7.0	2.4	12.8	6.4	7.9	—

† For the purpose of this Experiment "Sun-drying has been taken to imply "Air-dry basis"

\* Re-moistened.

**TABLE II**

**Preliminary Experimental Data on the Original Unretted Husks ("DECORTICATOR") Processing**

1	2					3	4	5	6	7	8
BATCH	ORIGINAL UNRETTED HUSKS					Wet Weight of 1000 husks after soaking for 2 hours & draining	Weight of Water absorbed by 1000 husks during soaking	Calc. wet weight of 1000 husks corrected for dryage during 1st Milling	% Moisture in soaked husks (5) corrected for dryage during 1st Milling	Weight of Water lost during 1st Milling	Dryage during first milling as % of (3)
	Weight of 1000 (Before soaking)	No. of Segments	Calc. from Exptl. Results								
			% Moisture in Original Husks (Before soaking)	Weight of 1000 husks (Air-dry Basis) *	Weight of 1000 husks (Oven-dry basis)						
I	1170	3366	48.5	677	600	2203	1033	1977	69.5	226	10.3
II	984	2956	41.8	704	624	1959	975	1876	69.5	83	4.2
III	979	3550	39.7	733	649	1970	991	1905	69.0	65	3.3
IV	1206	3440	49.7	736	652	2149	943	2030	70.1	119	5.5
V	1023	3150	42.5	694	611	1772	749	1701	65.4	71	4.0
VI	948	3114	41.6	717	624	1973	1025	1897	70.8	76	3.9
Mean (6)	1052	3263	44.0	709	627	2004	952	1898	69.1	107	5.2
C.V. (%)	9.4	6.3	8.5	3.0	3.0	7.0	10.1	5.4	2.5	52.5	45.7

\* For the purpose of this experiment "Sun-drying" has been taken to imply "Air-dry basis"

TABLE III

## Overall Recovery of Components during "DECORTICATOR" PROCESSING

Wet Weight Relationships \* (1000 husks per Batch) (In pounds)

1 BATCH	2 Calculated Wet Weight of 1000 husks (corrected for dryage during first Milling)	3 OVERALL RECOVERY OF COMPONENTS			
		MATTRESS FIBRE		FIBRE DUST (Composite)	
		Wet Wt. (lbs.)	As % of Original (2)	Wet Weight (lbs.)	As % of Original (2)
		I	1977	641	32.4
II	1876	559	29.8	1317	70.2
III	1905	945	49.6	960	50.4
IV	2030	891	43.9	1139	56.1
V	1701	572	33.6	1129	66.4
VI	1897	819	43.2	1078	56.8
Mean (6)	1898	738	38.8	1160	61.2
C.V. (%)	5.4	20.8	18.6	11.3	11.8

**NOTE** — \* In view of the moisture complications consequent on the need for re-moistening before Second Milling, the wet weights of fibre and dust recovered from the Second Milling have been *calculated* on the actual estimated moisture contents of these components after the First Milling. In other words, the calculations have been made on the basis that there were no moisture losses between the First and Second Millings.

**TABLE IV**

**Details pertaining to Recovery of the Components during First and Second Millings ("DECORTICATOR") Processing**

**Wet Weight Relationships (1000 husks per Batch) (In pounds)**

1 BATCH	2 Calculated Wet weight of 1000 husks (Corrected for dryage during First Milling)	3 FIRST MILLING				4 SECOND MILLING*				5 TOTAL RECOVERIES	
		Mattress Fibre (1)		Fibre Dust (1)		Mattress Fibre (2)		Fibre Dust (2)		Mattress Fibre (lbs.)	Fibre Dust (lbs.)
		lbs.	As % of Original (Correc- ted)	lbs.	As % of Original (Correc- ted)	lbs.	As % of Original (Correc- ted)	lbs.	As % of Original (Correc- ted)		
I	1977	1138	57.6	839	42.4	641	32.4	497	25.1	641	1336
II	1876	752	40.1	1124	59.9	559	29.8	193	10.3	559	1317
III	1905	1036	54.4	869	45.6	945	49.6	91	4.8	945	960
IV	2030	1041	51.3	989	48.7	891	43.9	150	7.4	891	1139
V	1701	708	41.6	993	58.4	572	33.6	136	8.0	572	1129
VI	1897	1009	53.2	888	46.8	819	43.2	190	10.0	819	1078
Mean (6)	1898	947	49.7	951	50.3	738	38.8	209	10.9	738	1160
C.V. (%)	5.4	16.8	13.2	10.2	13.0	20.8	18.6	63.4	60.5	20.8	11.3

**NOTE—** \* As in Table III, the wet weights of fibre and dust recovered from the Second Milling have been calculated on the actual estimated moisture contents of these components after the First Milling.

**TABLE V**

**Dry-Weight Relationships (1000 husks per batch) (Air-dry basis) \* "DECORTICATOR" Processing (In pounds).**

1 BATCH	2 Original Dry Weight of Husks (Calculated)	3 MATTRESS FIBRE (Sun-dried)						4 FIBRE DUST (Composite) (Sun-dried)					
		First Milling		Second Milling		Final Recovery		First Milling		Second Milling		Total	
		lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original
		I	677	600	88.6	338	49.9	338	49.9	77	11.4	262	38.7
II	704	449	63.8	333	47.3	333	47.3	255	36.2	116	16.5	371	52.7
III	733	534	72.9	488	66.6	488	66.6	199	27.1	46	6.3	245	33.4
IV	736	523	71.1	448	60.9	448	60.9	213	28.9	75	10.2	288	39.1
V	694	438	63.1	353	50.9	353	50.9	256	36.9	85	12.2	341	49.1
VI	717	560	78.1	455	63.5	455	63.5	157	21.9	105	14.6	262	36.5
Mean (6)	709	517	72.9	402	56.5	402	56.5	193	27.1	115	16.4	307	43.5
C.V.(%)	3.0	11.1	12.0	15.6	13.1	15.6	13.1	32.1	32.2	60.4	63.9	14.8	17.0

\* For the purpose of this Experiment " Air dry basis " signifies the weight of the components after Sun-drying.

**TABLE VI**

**Dry-Weight Relationships (1000 Husks per batch) (Oven-dry Basis)—“ DECORTICATOR ” Processing (In pounds)**

BATCH	Original Dry Weight of Husks (Calculated)	3						4					
		MATTRESS FIBRE						FIBRE DUST (Composite) *					
		First Milling		Second Milling		Final Recovery		First Milling		Second Milling		Total	
		lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original	lbs.	As % of Original
I	600	534	89.0	301	50.2	301	50.2	66	11.0	233	38.8	299	49.8
II	624	399	63.9	296	47.4	296	47.4	225	36.1	103	16.5	328	52.6
III	649	474	73.0	433	66.7	433	66.7	175	27.0	41	6.3	216	33.3
IV	652	465	71.3	398	61.0	398	61.0	187	28.7	67	10.3	254	39.0
V	611	384	62.8	310	50.7	310	50.7	227	37.2	74	12.1	301	49.3
V <sup>1</sup>	624	484	77.6	393	63.0	393	63.0	140	22.4	91	14.6	231	37.0
Mean (6)	627	457	72.9	355	56.5	355	56.5	170	27.1	102	16.4	272	43.5
C.V. (%)	3.0	11.2	12.1	15.3	13.0	15.3	13.0	32.5	32.5	60.7	64.1	14.9	16.9

\* Figures calculated by difference.



Average values have been worked out for total Mineral Matter, Nitrogen, Phosphorus, Potassium, Calcium and Magnesium on samples of extracted meals prepared from six random samples.

The full results obtained in the study are summarised in Tables IX to XXXVI.

### III. ARRACK.

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

The sap was collected in accordance with method (ST). In this method of tapping no anti-ferments or preservatives are added to the collection vessels. After each tapping however, the pots are washed and cleaned out, allowed to drain and then the inside is flame sterilized. The sap collected this way may be described as sweet toddy. The summarised data obtained on 155 samples of sweet toddy (ST) and the "High Wines" distilled therefrom are presented in Table XXXVII. The results are tabulated for 5-day sample averages.

### IV. POT CULTURE EXPERIMENT.

- (a) The eighth sand pot-culture experiment on 252 seedlings laid down on 20th March, 1968, to study the pattern of nutrient distribution in the leaves (by rank) for seven treatments using the "Leaf-punch" technique, was continued during the year.
- (b) In a collateral experiment 45 sprouted drupes (without husk) were planted in a plot in the field on 20th March, 1968, to make observations on the growth performance of the seedlings. The planting material used for this experiment comprised the over-sized and undersized sprouted drupes rejected after selections were made for planting in the pots. The following observations have been made in this experiment :—
  - (i) On 30.6.68 (i.e. on the date of amputation of drupes) the number of seedlings surviving was 24, i.e. 53.3%.
  - (ii) A large proportion of the failures resulted from termite attack of the sprouts.
  - (iii) On 30.12.68 all the 24 seedlings (12 amputated and 12 non-amputated) continued to progress satisfactorily.
- (c) The chemical examination of plant samples prepared from previous pot-culture experiments was continued.

### V. 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. The concluding analyses and observations were made on the productive phase of a single palm, at the end of the 8th year of the experiment.

**TABLE IX**

**Mineral Content of the Coconut Kernel (Ripe Green Nuts)**

(All figures expressed on Dry basis)

REGION	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% TOTAL MINERAL MATTER (ASH)								% TOTAL MINERAL MATTER (ASH)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	5.87	5.52	5.07	3.09	4.22	4.75	21.0	—	1.83	1.73	1.58	0.97	1.32	1.49
RT	—	7.87	8.22	7.17	2.33	4.68	6.05	37.0	—	1.71	1.78	1.56	0.51	1.02	1.32
IR	—	9.53	7.18	6.49	5.59	5.49	6.86	21.5	—	2.51	1.89	1.71	1.47	1.45	1.81
RW	—	11.91	8.47	8.41	7.49	7.70	8.80	18.2	—	5.50	3.91	3.89	3.46	3.56	4.06
MEAN	—	8.80	7.35	6.79	4.63	5.52	6.62	—	—	2.89	2.33	2.19	1.60	1.84	2.17

**TABLE X**

**Mineral Content of the Coconut Kernel (Mature Kalati)**

(All figures expressed on Dry basis)

T	—	8.57	13.25	9.68	11.32	10.93	10.75	14.7	—	3.00	4.64	3.39	3.96	3.83	3.76
RT	—	7.85	11.01	9.33	8.91	9.39	9.30	11.0	—	1.96	2.74	2.32	2.22	2.34	2.32
IR	—	7.96	8.71	7.45	7.88	7.64	7.93	5.4	—	2.03	2.22	1.90	2.01	1.95	2.02
RW	—	9.83	9.73	9.39	8.52	8.39	9.17	6.6	—	4.01	3.98	3.84	3.48	3.43	3.75
MEAN	—	8.55	10.68	8.96	9.16	9.09	9.29	—	—	2.75	3.40	2.86	2.92	2.89	2.96

T = Testa

RT = Region near Testa

IR = Intermediate Region

RW = Region near Water Cavity

C.V. = Coefficient of variation

\* Calculated on the basis of the following mean oil contents (dry basis) :—

T =  
RT =  
IR =  
RW =

Ripe Green Nuts

68.74

78.31

73.66

53.78

Mature Kalati

64.98

75.09

74.48

59.13

**TABLE XI**

**Mineral Content of the Coconut Kernel (Kalati)**

(All figures expressed on Dry basis)

REGION	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% TOTAL MINERAL MATTER (ASH)								% TOTAL MINERAL MATTER (ASH)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	13.66	12.95	14.19	13.22	10.80	12.96	9.0	—	5.77	5.47	6.00	5.59	4.56	5.48
RT	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
IR	—	12.20	14.16	12.13	9.27	8.42	11.24	18.7	—	3.58	4.15	3.56	2.72	2.47	3.30
RW	—	12.22	12.84	9.77	8.58	9.06	10.49	16.4	—	4.85	5.10	3.88	3.41	3.60	4.17
MEAN	—	12.69	13.32	12.03	10.36	9.43	11.56	—	—	4.73	4.91	4.48	3.91	3.54	4.32

**TABLE XII**

**Mineral Content of the Coconut Kernel (Tender Kalati)**

(All figures expressed on Dry Basis)

RT	—	12.33	17.08	14.75	11.42	12.28	13.57	15.3	—	6.00	8.31	7.18	5.56	5.97	6.60
RW	—	13.49	15.30	12.60	9.35	10.85	12.32	16.8	—	6.59	7.48	6.16	4.57	5.30	6.02
MEAN	—	12.91	16.19	13.68	10.39	11.57	12.95	—	—	6.30	7.90	6.67	5.07	5.64	6.31

\* Calculated on the basis of the following mean oil contents (dry basis)

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity  
 C.V. = Coefficient of variation

T =	Kalati	Tender Kalati
RT =	57.75	—
IR =	—	51.35
RW =	70.68	—
	60.28	51.13

**TABLE XIII**

**Nitrogen Content of the Coconut Kernel (Ripe Green Nuts)**  
(All figures expressed on Dry Basis)

Region	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% NITROGEN (as N)								% NITROGEN (as N)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	3.93	3.95	3.76	4.02	4.42	4.02	5.5	—	1.23	1.23	1.18	1.26	1.38	1.26
RT	—	5.34	5.31	4.50	—	4.82	4.99	7.0	—	1.16	1.15	0.98	—	1.05	1.09
IR	—	4.22	4.64	3.77	1.28	4.02	3.59	33.1	—	1.11	1.22	0.99	0.34	1.06	0.94
RW	—	2.92	2.69	2.30	2.08	1.24	2.25	25.9	—	1.35	1.24	1.06	0.96	0.57	1.04
MEAN	—	4.10	4.15	3.58	2.46	3.63	3.58	—	—	1.21	1.21	1.05	0.85	1.02	1.08

**TABLE XIV**

**Nitrogen Content of the Coconut Kernel (Mature Kalati)**

(All figures expressed on Dry Basis)

T	—	4.19	4.40	3.85	3.15	3.57	3.83	11.6	—	1.47	1.54	1.35	1.10	1.25	1.34
RT	—	4.98	2.75	5.17	4.13	4.00	4.21	20.4	—	1.24	0.69	1.29	1.03	1.00	1.05
IR	—	4.72	4.96	4.40	4.34	4.05	4.49	7.0	—	1.20	1.27	1.12	1.11	1.03	1.15
RW	—	2.56	5.07	—	2.71	3.03	3.34	30.3	—	1.05	2.07	—	1.11	1.24	1.37
MEAN	—	4.11	4.30	4.47	3.58	3.66	4.02	—	—	1.24	1.39	1.25	1.09	1.13	1.22

\* Calculated on the basis of the following mean oil contents (dry basis) :—

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity  
 C.V. = Coefficient of variation

	Ripe Green Nuts	Mature Kalati
T =	68.74	64.98
RT =	78.31	75.09
IR =	73.66	74.48
RW =	53.78	59.13

**TABLE XV**

**Nitrogen Content of the Coconut Kernel (Kalati)**  
(All figures expressed on Dry Basis)

	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% NITROGEN (as N)								% NITROGEN (as N)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	3.25	4.85	3.90	3.74	3.45	3.84	14.4	—	1.37	2.05	1.65	1.58	1.46	1.62
IR	—	3.48	6.55	5.52	4.11	4.19	4.77	23.3	—	1.02	1.92	1.62	1.21	1.23	1.40
RW	—	2.45	3.74	2.83	2.82	3.17	3.00	14.5	—	0.97	1.49	1.12	1.12	1.26	1.19
Mean	—	3.06	5.05	4.08	3.56	3.60	3.87	—	—	1.12	1.82	1.46	1.30	1.32	1.40

**TABLE XVI**

**Nitrogen Content of the Coconut Kernel (Tender Kalati)**  
(All figures expressed on Dry Basis)

RT	—	3.59	5.09	3.77	—	—	4.15	16.1	—	1.75	2.48	1.83	—	—	2.02
RW	—	2.69	4.00	3.35	2.72	3.63	3.28	15.6	—	1.31	1.95	1.64	1.33	1.77	1.60
Mean	—	3.14	4.55	3.56	2.72	3.63	3.52	—	—	1.53	2.22	1.74	1.33	1.77	1.72

\* Calculated on the basis of the following mean oil contents (dry basis):—

T = Testa  
RT = Region near Testa  
IR = Intermediate Region  
RW = Region near Water Cavity

C.V. = Coefficient of Variation.

	Kalati	Tender Kalati
T =	57.75	—
RT =	—	51.35
IR =	70.68	—
RW =	60.28	51.13

**TABLE XVII**

**Protein Content of the Coconut Kernel (Ripe Green Nuts)**

(All figures expressed on Dry Basis)

Region	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% PROTEIN								% PROTEIN						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	24.6	24.7	23.5	25.1	27.6	25.1	5.4	—	7.7	7.7	7.4	7.9	8.6	7.9
RT	—	33.4	33.2	28.1	—	30.1	31.2	7.1	—	7.3	7.2	6.1	—	6.6	6.8
IR	—	26.4	29.0	23.6	8.0	25.1	22.4	33.1	—	6.9	7.6	6.2	2.1	6.6	5.9
RW	—	18.3	16.8	14.4	13.0	7.8	14.1	25.7	—	8.4	7.8	6.6	6.0	3.6	6.5
Mean	—	25.7	25.9	22.4	15.4	22.7	22.4	—	—	7.6	7.6	6.7	5.3	6.4	6.8

**TABLE XVIII**

**Protein Content of the Coconut Kernel (Mature Kalati)**

(All figures expressed on Dry Basis)

T	—	26.2	27.5	24.1	19.7	22.3	24.0	11.6	—	9.2	9.6	8.4	6.9	7.8	8.4
RT	—	31.1	17.2	32.3	25.8	25.0	26.3	20.4	—	7.8	4.3	8.1	6.4	6.3	6.6
IR	—	29.5	31.0	27.5	27.1	25.3	28.1	7.0	—	7.5	7.9	7.0	6.9	6.4	7.1
RW	—	16.0	31.7	—	16.9	18.9	20.9	30.3	—	6.6	12.9	—	6.9	7.8	8.6
Mean	—	25.7	26.9	28.0	22.4	22.9	25.2	—	—	7.8	8.7	7.8	6.8	7.1	7.6

\* Calculated on the basis of the following mean oil contents (dry basis) :—

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity  
 C.V. = Coefficient of variation

T =	Ripe Green Nuts	Mature Kalati
RT =	68.74	64.98
IR =	78.31	75.09
RW =	73.66	74.48
	53.78	59.13

**TABLE XIX**

**Protein Content of the Coconut Kernel (Kalati)**  
(All figures expressed on Dry Basis)

1	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
Region	% PROTEIN								% PROTEIN						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	20.3	30.3	24.4	23.4	21.6	24.0	14.4	—	8.6	12.8	10.3	9.9	9.1	10.1
IR	—	21.7	40.9	34.5	25.7	26.2	29.8	23.3	—	6.4	12.0	10.1	7.6	7.7	8.8
RW	—	15.3	23.3	17.7	17.6	19.8	18.7	14.4	—	6.1	9.3	7.0	7.0	7.8	7.4
Mean	—	19.1	31.5	25.5	22.2	22.5	24.2	—	—	7.0	11.4	9.1	8.2	8.2	8.8

**TABLE XX**

**Protein Content of the Coconut Kernel (Tender Kalati)**  
(All figures expressed on Dry Basis)

RT	—	22.4	31.8	23.6	—	—	25.9	12.5	—	10.9	15.5	11.4	—	—	12.6
RW	—	16.8	25.0	20.9	17.0	22.7	20.5	15.6	—	8.2	12.2	10.3	8.3	11.1	10.0
Mean	—	19.6	28.4	22.3	17.0	22.7	23.2	—	—	9.6	13.9	10.9	8.3	11.1	11.3

\* Calculated on the basis of the following mean oil contents (dry basis) :—

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity  
 C.V. = Coefficient of variation.

T =	Kalati	Tender Kalati
RT =	57.75	—
IR =	—	51.35
RW =	70.68	—
	60.28	51.13

**TABLE XXI**

**Phosphorus Content of the Coconut Kernel (Ripe Green Nuts)**  
(All figures expressed on Dry Basis)

Region	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% Phosphorus (as P <sub>2</sub> O <sub>5</sub> )								% Phosphorus (as P <sub>2</sub> O <sub>5</sub> )						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	1.61	1.36	1.34	1.61	1.44	1.47	8.0	—	0.50	0.43	0.42	0.50	0.45	0.46
RT	—	2.03	1.83	1.56	1.61	1.54	1.71	11.0	—	0.44	0.40	0.34	0.35	0.33	0.37
IR	—	1.98	1.55	1.34	1.23	1.56	1.53	16.8	—	0.52	0.41	0.35	0.32	0.41	0.40
RW	—	1.45	1.21	1.10	0.95	1.23	1.19	13.8	—	0.67	0.56	0.51	0.44	0.57	0.55
Mean	—	1.77	1.49	1.34	1.35	1.44	1.48	—	—	0.53	0.45	0.41	0.40	0.44	0.45

**TABLE XXII**

**Phosphorus Content of the Coconut Kernel (Mature Kalati)**  
(All figures expressed on Dry Basis)

T	—	—	1.62	1.44	1.24	1.35	1.41	9.9	—	—	0.57	0.50	0.43	0.47	0.49
RT	—	1.96	1.31	1.59	1.33	1.43	1.52	15.7	—	0.49	0.33	0.40	0.33	0.36	0.38
IR	—	1.92	1.75	1.47	1.41	1.60	1.63	11.4	—	0.49	0.45	0.38	0.36	0.41	0.42
RW	—	1.43	1.64	1.12	1.03	1.23	1.29	17.1	—	0.58	0.67	0.46	0.42	0.50	0.53
Mean	—	1.77	1.58	1.41	1.25	1.40	1.47	—	—	0.52	0.51	0.44	0.39	0.44	0.46

\* Calculated on the basis of the following mean oil contents (dry basis) :

T = Testa  
RT = Region near Testa  
IR = Intermediate Region  
RW = Region near Water Cavity

C.V. = Coefficient of Variation

T =	Ripe Green Nuts	Mature Kalati
RT =	68.74	64.98
IR =	78.31	75.09
RW =	73.66	74.48
	53.78	59.13

**TABLE XXIII**

**Phosphorus Content of the Coconut Kernel (Kalati)**  
(All figures expressed on Dry Basis)

Region	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% Phosphorus (as P <sub>2</sub> O <sub>5</sub> )								% Phosphorus (as P <sub>2</sub> O <sub>5</sub> )						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	—	1.90	1.39	1.55	1.29	1.53	15.1	—	—	0.803	0.587	0.655	0.545	0.648
IR	—	—	1.81	1.49	1.30	1.31	1.48	13.9	—	—	0.531	0.437	0.381	0.384	0.433
RW	—	—	1.34	0.95	1.13	1.26	1.17	12.6	—	—	0.532	0.377	0.449	0.500	0.465
Mean	—	—	1.68	1.28	1.33	1.29	1.39	—	—	—	0.622	0.467	0.495	0.476	0.515

**TABLE XXIV**

**Phosphorus Content of the Coconut Kernel (Tender Kalati)**  
(All figures expressed on Dry Basis)

RT	—	—	1.79	1.31	1.25	1.20	1.39	16.9	—	—	0.87	0.64	0.61	0.58	0.68
RW	—	—	1.07	0.95	0.93	0.95	0.98	5.7	—	—	0.53	0.46	0.45	0.46	0.48
Mean	—	—	1.43	1.13	1.09	1.08	1.18	—	—	—	0.70	0.55	0.53	0.52	0.58

\* Calculated on the basis of the following mean oil contents (dry basis) :—

		Kalati	Tender Kalati
T	= Testa	57.75	—
RT	= Region near Testa	—	51.35
IR	= Intermediate Region	70.68	—
RW	= Region near Water Cavity	60.28	51.13

C.V. = Coefficient of variation.

**TABLE XXV**

**Potassium Content of the Coconut Kernel (Ripe Green Nuts)**

(All figures expressed on Dry Basis)

1 Region	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% Potassium (as K <sub>2</sub> O)								% Potassium (as K <sub>2</sub> O)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	0.55	1.34	0.76	0.729	1.17	0.91	32.5	—	0.17	0.42	0.24	0.23	0.37	0.29
RT	—	2.33	1.01	1.29	0.834	1.26	1.34	38.9	—	0.51	0.22	0.28	0.18	0.27	0.29
IR	—	2.97	1.38	1.61	1.33	1.62	1.78	34.0	—	0.78	0.36	0.42	0.35	0.43	0.47
RW	—	4.86	3.28	3.17	2.79	3.48	3.52	20.1	—	2.25	1.52	1.47	1.29	1.61	1.63
MEAN	—	2.68	1.75	1.71	1.42	1.88	1.89	—	—	0.93	0.63	0.60	0.51	0.67	0.67

**TABLE XXVI**

**Potassium Content of the Coconut Kernel (Mature Kalati)**

(All figures expressed on Dry Basis)

T	—	2.25	4.97	3.78	4.18	4.56	3.95	23.7	—	0.79	1.74	1.32	1.46	1.60	1.38
RT	—	2.93	3.94	1.99	2.63	3.34	2.97	22.1	—	0.73	0.98	0.50	0.66	0.83	0.74
IR	—	3.58	2.85	2.79	2.59	3.47	3.06	12.9	—	0.91	0.73	0.71	0.66	0.89	0.78
RW	—	3.45	3.76	3.94	3.28	3.76	3.64	6.6	—	1.41	1.54	1.61	1.34	1.54	1.49
MEAN	—	3.05	3.88	3.13	3.17	3.78	3.40	—	—	0.96	1.25	1.04	1.03	1.27	1.11

\* Calculated on the basis of the following mean oil contents (dry basis) :—

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity  
 C.V. = Coefficient of variation

	Ripe Green Nuts	Mature Kalati
T =	68.74	64.98
RT =	78.31	75.09
IR =	73.66	74.48
RW =	53.78	59.13

**TABLE XXVII**

**Potassium Content of the Coconut Kernel (Kalati)**

(All figures expressed on Dry Basis)

1 Region	2									3					
	EXTRACTED OIL-FREE MEAL									* ORIGINAL KERNEL (CALCULATED)					
	% Potassium (as K <sub>2</sub> O)									% Potassium (as K <sub>2</sub> O)					
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	4.50	4.74	6.14	4.67	4.01	4.81	14.8	—	1.90	2.00	2.59	1.97	1.69	2.03
IR	—	4.00	5.19	4.52	3.53	3.18	4.08	17.5	—	1.17	1.52	1.33	1.03	0.93	1.20
RW	—	5.07	5.08	3.83	3.91	3.53	4.28	15.4	—	2.01	2.02	1.53	1.55	1.40	1.70
Mean	—	4.52	5.00	4.83	4.04	3.57	4.39	—	—	1.69	1.85	1.81	1.52	1.34	1.64

**TABLE XXVIII**

**Potassium Content of the Coconut Kernel (Tender Kalati)**

(All figures expressed on Dry Basis)

RT	—	4.84	6.40	5.05	4.26	4.08	4.93	16.6	—	2.35	3.11	2.46	2.07	1.98	2.39
RW	—	4.62	6.65	5.27	4.57	4.56	5.13	15.7	—	2.26	3.25	2.58	2.23	2.23	2.51
Mean	—	4.73	6.53	5.16	4.42	4.32	5.03	—	—	2.31	3.18	2.52	2.15	2.11	2.45

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity

C.V. = Coefficient of variation.

\* Calculated on the basis of the following mean oil contents (dry basis) :—

	Kalati	Tender Kalati
T	57.75	—
RT	—	51.35
IR	70.68	—
RW	60.28	51.13

**TABLE XXIX**

**Calcium Content of the Coconut Kernel (Ripe Green Nuts)**

(All figures expressed on Dry Basis)

Region	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% Calcium (as CaO)								% Calcium (as CaO)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	0.144	0.054	0.063	0.105	0.078	0.091	33.6	—	0.045	0.020	0.020	0.032	0.025	0.028
RT	—	0.126	0.074	0.134	0.108	0.050	0.098	32.5	—	0.028	0.021	0.029	0.024	0.011	0.023
IR	—	0.101	0.139	0.083	0.095	0.043	0.092	33.6	—	0.027	0.036	0.021	0.025	0.011	0.024
RW	—	0.144	0.112	0.099	0.090	0.091	0.107	18.7	—	0.067	0.052	0.046	0.042	0.042	0.050
Mean	—	0.128	0.098	0.095	0.099	0.066	0.097	—	—	0.042	0.032	0.029	0.031	0.022	0.031

**TABLE XXX**

**Calcium Content of the Coconut Kernel (Mature Kalati)**

(All figures expressed on Dry Basis)

T	—	0.144	0.063	0.190	0.076	0.090	0.113	42.0	—	0.050	0.022	0.067	0.027	0.031	0.039
RT	—	0.060	0.164	0.306	0.062	0.067	0.132	72.4	—	0.015	0.041	0.077	0.015	0.017	0.033
IR	—	0.078	0.097	0.269	0.083	0.088	0.123	59.6	—	0.020	0.025	0.069	0.021	0.022	0.031
RW	—	0.137	0.053	0.122	0.136	0.153	0.120	29.2	—	0.056	0.022	0.050	0.056	0.063	0.049
Mean	—	0.105	0.094	0.222	0.090	0.099	0.122	—	—	0.035	0.028	0.066	0.029	0.036	0.039

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity

C.V. = Coefficient of variation

\* Calculated on the basis of the following mean oil contents (dry basis) :—

	Ripe Green Nuts	Mature Kalati
T =	68.74	64.98
RT =	78.31	75.09
IR =	73.66	74.48
RW =	53.78	59.13

**TABLE XXXI**

**Calcium Content of the Coconut Kernel (Kalati)**

(All figures expressed on Dry Basis)

1 Region	2 EXTRACTED OIL-FREE MEAL								3 * ORIGINAL KERNEL (CALCULATED)						
	% Calcium (as CaO)								% Calcium (as CaO)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	0.137	0.130	0.121	0.098	0.080	0.113	18.8	—	0.057	0.055	0.052	0.042	0.034	0.048
IR	—	0.153	0.127	0.245	0.067	0.064	0.131	50.7	—	0.045	0.038	0.071	0.020	0.018	0.038
RW	—	0.235	0.214	0.049	0.112	0.139	0.150	45.3	—	0.094	0.085	0.020	0.045	0.055	0.060
Mean	—	0.175	0.157	0.139	0.092	0.094	0.131	—	—	0.066	0.059	0.048	0.035	0.035	0.049

**TABLE XXXII**

**Calcium Content of the Coconut Kernel (Tender Kalati)**

(All figures expressed on Dry Basis)

RT	—	0.121	0.155	0.139	0.081	0.127	0.125	19.8	—	0.059	0.076	0.067	0.039	0.062	0.061
RW	—	0.020	0.203	0.215	0.130	0.186	0.151	47.4	—	0.010	0.099	0.105	0.063	0.091	0.074
Mean	—	0.071	0.179	0.177	0.106	0.157	0.138	—	—	0.035	0.088	0.087	0.052	0.077	0.068

\* Calculated on the basis of the following mean oil contents (dry basis) :—

T = Testa  
 RT = Region near Testa  
 IR = Intermediate Region  
 RW = Region near Water Cavity  
 C.V. = Coefficient of variation.

T =	Kalati	Tender Kalati
RT =	57.75	—
IR =	—	51.35
RW =	70.68	—
	60.28	51.13

**TABLE XXXIII**

**Magnesium Content of the Coconut Kernel (Ripe Green Nuts)**  
(All figures expressed on Dry Basis)

Region	2								3						
	EXTRACTED OIL-FREE MEAL								* ORIGINAL KERNEL (CALCULATED)						
	% Magnesium (as MgO)								% Magnesium (as MgO)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	0.250	0.355	0.637	0.085	0.610	0.388	54.6	—	0.078	0.111	0.199	0.027	0.191	0.121
RT	—	0.487	1.418	0.245	0.118	0.859	0.625	75.2	—	0.106	0.307	0.053	0.025	0.186	0.135
IR	—	0.406	0.560	0.338	0.158	0.282	0.349	38.2	—	0.108	0.148	0.090	0.041	0.075	0.092
RW	—	0.675	0.342	0.395	0.113	0.536	0.412	45.9	—	0.312	0.158	0.182	0.051	0.247	0.190
Mean	—	0.454	0.668	0.405	0.118	0.572	0.443	—	—	0.150	0.181	0.131	0.036	0.174	0.134

**TABLE XXXIV**

**Magnesium Content of the Coconut Kernel (Mature Kalati)**  
(All figures expressed on Dry Basis)

T	—	0.948	1.117	0.637	0.925	0.696	0.865	20.3	—	0.332	0.391	0.222	0.323	0.244	0.302
RT	—	0.705	0.665	0.762	1.036	0.725	0.779	17.0	—	0.176	0.166	0.191	0.259	0.181	0.195
IR	—	0.454	1.263	0.531	1.136	0.577	0.792	42.6	—	0.158	0.322	0.136	0.290	0.148	0.211
RW	—	0.391	1.151	0.549	—	0.438	0.632	48.3	—	0.159	0.469	0.390	—	0.179	0.299
Mean	—	0.667	1.049	0.620	1.033	0.608	0.795	—	—	0.206	0.337	0.194	0.290	0.250	0.255

T = Testa  
RT = Region near Testa  
IR = Intermediate Region  
RW = Region near Water Cavity

C.V. = Coefficient of variation

\* Calculated on the basis of the following mean oil contents (dry basis):—

	Ripe Green Nuts	Mature Kalati
T	68.74	64.98
RT	78.31	75.09
IR	73.66	74.48
RW	53.78	59.13

**TABLE XXXV**

**Magnesium Content of the Coconut Kernel (Kalati)**  
(All figures expressed on Dry Basis)

1 Region	2 EXTRACTED OIL-FREE MEAL								3 * ORIGINAL KERNEL (CALCULATED)						
	% Magnesium (as MgO)								% Magnesium (as MgO)						
	I	II	III	IV	V	VI	Mean	C.V.(%)	I	II	III	IV	V	VI	Mean
T	—	0.620	1.076	0.265	0.368	0.746	0.615	46.7	—	0.264	0.458	0.112	0.156	0.317	0.261
IR	—	0.449	1.343	0.245	0.753	0.612	0.680	54.7	—	0.131	0.393	0.071	0.221	0.179	0.199
RW	—	0.313	0.705	0.612	0.504	0.550	0.537	24.3	—	0.124	0.280	0.244	0.201	0.219	0.214
Mean	—	0.461	1.041	0.375	0.542	0.637	0.611	—	—	0.172	0.376	0.143	0.192	0.239	0.224

**TABLE XXXVI**

**Magnesium Content of the Coconut Kernel (Tender Kalati)**  
(All figures expressed on Dry Basis)

RT	—	1.010	1.210	0.217	0.943	0.696	0.815	41.9	—	0.491	0.589	0.106	0.459	0.338	0.397
RW	—	0.718	0.713	0.318	0.229	0.486	0.493	40.5	—	0.351	0.348	0.156	0.111	0.237	0.241
Mean	—	0.864	0.962	0.269	0.587	0.591	0.655	—	—	0.421	0.469	0.131	0.285	0.288	0.319

T = Testa  
RT = Region near Testa  
IR = Intermediate Region  
RW = Region near Water Cavity

C.V. = Coefficient of variation

\* Calculated on the basis of the following mean oil contents (dry basis):—

	Kalati	Tender Kalati
T =	57.75	—
RT =	—	51.35
IR =	70.68	—
RW =	60.28	51.13

TABLE XXXVII—ANALYSIS OF SWEET TODDY AND HIGH WINES (ST)—ONE FIFTH ORIGINAL COLLECTED AS HIGH WINES

(EACH SAMPLE IS AN AVERAGE OF FIVE DAYS COLLECTION)

M — Morning  
E — Evening

Sample No.	TOTAL SOLIDS %			ACIDITY %					DISTILLATION			
	Collection Day	First Day	Second Day	Collection Day		First Day		Second Day	Volume of Toddy Distilled	Volume of Arrack Collected	Specific Gravity	% Alcohol by Volume
	M	M	M	M	E	M	E	M				
1	17.43	9.48	7.02	0.35	0.56	0.95	1.01	1.07	4000	800	0.962	33.90
2	17.47	9.08	6.55	0.32	0.56	0.81	0.89	0.93	3980	796	0.959	36.60
3	17.48	8.12	6.92	0.33	0.57	0.84	0.87	0.92	4000	800	0.960	35.90
4	17.73	9.38	8.13	0.26	0.55	0.85	0.89	0.97	3860	772	0.964	32.20
5	17.85	8.51	7.10	0.31	0.53	0.92	0.96	1.00	4000	800	0.959	35.40
6	17.68	8.17	6.36	0.38	0.61	0.88	0.92	0.95	3200	640	0.958	36.60
7	18.27	8.34	6.45	0.34	0.58	0.85	0.90	0.93	4000	800	0.958	35.80
8	16.87	6.62	5.49	0.41	0.61	0.81	0.83	0.86	3200	640	0.958	36.00
9	16.91	5.92	4.75	0.42	0.61	0.71	0.77	0.81	2400	480	0.951	40.20
10	16.31	5.98	5.11	0.35	0.53	0.76	0.80	0.81	3360	672	0.956	35.60
11	16.86	6.54	5.28	0.31	0.55	0.70	0.75	0.78	4000	800	0.957	34.20
12	17.67	7.20	5.69	0.39	0.59	0.72	0.77	0.79	3600	720	0.957	36.80
13	17.01	6.13	4.97	0.38	0.56	0.67	0.72	0.75	4000	800	0.952	39.80
14	17.35	6.43	5.00	0.36	0.56	0.72	0.77	0.80	3720	744	0.951	40.40
15	17.75	6.29	5.07	0.35	0.52	0.64	0.68	0.71	4000	800	0.954	38.40
16	18.13	8.33	6.90	0.28	0.51	0.70	0.74	0.82	1875	375	0.962	34.00
17	18.95	10.73	6.17	0.26	0.41	0.74	0.78	0.83	2060	412	0.955	37.00
18	17.85	7.64	6.35	0.29	0.47	0.72	0.78	0.82	4000	800	0.957	36.60
19	18.98	8.59	6.68	0.26	0.46	0.71	0.76	0.79	3600	720	0.958	36.00
20	18.43	8.20	7.16	0.30	0.52	0.75	0.77	0.81	4000	800	0.961	34.40
21	19.12	9.93	7.32	0.26	0.45	0.82	0.86	0.89	4000	800	0.958	35.80
22	18.68	9.35	6.89	0.31	0.51	0.76	0.77	0.83	3360	672	0.955	38.20
23	17.78	7.89	6.00	0.34	0.50	0.76	0.79	0.82	3200	640	0.961	34.20
24	18.84	7.88	5.99	0.27	0.46	0.71	0.74	0.76	3265	653	0.953	39.80
25	18.49	8.11	6.18	0.26	0.48	0.73	0.76	0.80	2100	420	0.954	39.00
26	18.64	8.29	6.17	0.24	0.46	0.73	0.77	0.81	3020	604	0.957	36.40
27	17.11	6.74	5.74	0.29	0.50	0.79	0.82	0.96	2700	540	0.960	34.20
28	17.36	7.40	5.95	0.25	0.48	0.81	0.82	0.87	3275	655	0.960	34.00
29	17.04	6.23	4.73	0.37	0.57	0.69	0.76	0.82	2725	545	0.956	38.00
30	17.23	7.38	5.81	0.38	0.55	0.85	0.90	0.94	2920	584	0.961	34.20
31	17.15	7.56	6.08	0.32	0.57	0.83	0.89	0.94	2475	495	0.958	35.80
Overall Average	17.76	7.82	6.13	0.32	0.53	0.77	0.81	0.86	3351	670	0.957	36.30

**TABLE—XXXVIII**  
**BANDIRIPPUWA ESTATE**

Set No. & Date	No. 1/26.7.68			No. 2/24.10.68		
Name of Variety	% Moisture	% Oil (Wet)	% Oil (Dry)	% Moisture	% Oil (Wet)	% Oil (Dry)
Bodiri (1) *	5.37	65.87	69.60	5.95	63.47	67.48
Bodiri (2) **	5.52	64.56	68.33	5.56	62.89	66.60
Dwarf Green (1)	5.34	65.90	69.61	4.81	64.64	70.01
Dwarf Green (2)	5.07	65.29	68.77	4.21	68.94	71.97
Dwarf Red (1)	5.23	62.66	66.11	5.40	62.06	65.61
Dwarf Red (2)	4.78	63.30	66.48	5.61	61.29	64.99
Dwarf Yellow (1)	4.63	63.25	66.31	5.86	63.30	67.24
Dwarf Yellow (2)	5.00	62.31	65.59	5.61	61.77	65.05
Gon Thembili (1)	4.99	65.45	68.89	4.70	66.00	69.25
Gon Thembili (2)	—	—	—	4.81	66.33	69.68
Kamandala	5.49	64.18	67.91	4.62	68.99	72.33
Navasi (1)	4.90	66.19	69.60	4.52	67.19	70.36
Navasi (2)	—	—	—	5.64	63.62	67.42
Ord. K. C. (1)	4.81	63.29	66.49	5.11	63.22	66.62
Ord. K. C. (2)	5.09	62.40	65.75	5.55	65.11	68.94
Navasi Thembili	4.96	61.67	64.89	4.93	64.55	67.89
Ran Thembili (1)	5.58	62.38	66.07	5.86	61.89	65.74
Ran Thembili (2)	—	—	—	5.66	60.73	64.37
Typica (1)	5.53	64.95	68.75	4.83	64.53	67.80
Typica (2)	—	—	—	5.15	65.11	68.64

<b>RATMALAGARA ESTATE</b>						
	No. : 1/7.9.68			No. : 2/5.11.68		
Dwarf Green	4.56	66.83	70.02	4.54	63.12	66.12
Dwarf Red	4.99	66.55	69.04	—	—	—
Dwarf Yellow	4.96	63.68	67.01	5.30	62.62	66.12
Natural Hybrid	5.10	64.33	67.79	5.04	63.51	66.87

\* 1 = Number One Copra

\*\* 2 = Number Two Copra

## VI. COCONUT VARIETIES GROWN IN CEYLON.

Samples of copra prepared by the Division of Botany from coconut varieties and forms grown in Ceylon were examined and reported on for oil content. The results that have been obtained so far are summarised in Table XXXVIII.

## VII. MISCELLANEOUS WORK.

A sample of sheep manure sent by an estate owner was analysed with the following results :—

				Per cent
Moisture	...	...	...	13.3
Nitrogen (as N)	...	...	...	2.7 (Moisture-free basis)
Potash (as $K_2O$ )	...	...	...	1.4 ( " " " )
Phosphorus (as $P_2O_5$ )	...	...	...	1.1 ( " " " )
Ash	...	...	...	45.7 ( " " " )

It will be observed that close on half the samples is mineral matter—mostly sand.

M. JEGANATHAN,  
*Officer-in-Charge,*  
*Chemistry Division.*

## REPORT OF THE OFFICER-IN-CHARGE, BOTANY DIVISION, for the year 1968

1. The post of Botanist remaining vacant, and in the absence of the Research Assistant on overseas study leave, the Division functioned throughout the year under an Officer of the Assistant Staff Grade.

2. **Field Experiments :** A total of 28 Field Experiments and observation plots at Bandirippuwa Estate (13) Rathmalagara Estate (5) Walpita (1) and Pothukulama Research Station (9) commenced by the former Botanist, were maintained throughout the year. Records of Yields, weights of nuts and other data, were collected as before.

3. **Hybridization :** The programme for the production of commercial seed by hand-pollination of selected female parents, with pollen from palms of High breeding value was continued at the following stations :

- (a) Achchitotam Estate, Mundel
- (b) Bandirippuwa Estate, Lunuwila
- (c) Marandawila Estate, Bingiriya
- (d) Isolated Seed Garden, Rajakadaluwa
- (e) Rathmalagara Estate, Madampe
- (f) Kinyama Estate, Weerapokuna
- (g) Andigedera Estate, Weerapokuna

The number of seednuts harvested from the above stations arising from pollinations of the previous year are as follows :

Stations	Tall x Tall	Tall x Dwarf	Open Pollinated
Achchitotam Estate	6554	nil	19
Bandirippuwa Estate	4144	nil	nil
Marandawila Estate	3039	nil	nil
Isolated Seed Garden	2539	nil	nil
Rathmalagara Estate	3333	nil	nil
Kinyama Estate	nil	5505	nil
Andigedera Estate	nil	nil	nil

15,143 pollinated nuts arising from 55,168 female flowers pollinated in 1967 were harvested during the year. The total female flowers pollinated in 1968 was 164,780.

Systematic emasculatation of the Dwarf palms at the Isolated Seed Garden for the large scale production of Hybrid seed was continued. 27,991 seednuts (Dwarf x Tall) resulting from open pollination of the emasculated Dwarf palms were harvested.

394 tubes of *Typica* pollen and 532 tubes of *Nana* pollen were supplied to 18 private estates for their own pollination work. 7 visits were made to these estates to check the pollination work.

Hand pollinated seedlings issued during the year were as follows :

	Tall x Tall	Dwarf x Tall	Open Pollinated
May/June	4565	2316	nil
October/November	3152	3733	125
Total	<u>7717</u>	<u>6049</u>	<u>125</u>

4. **Nurseries :** The two nurseries at Bandirippuwa Estate were maintained in good order. The old nursery which was left fallow since 1967 was again made use of to accommodate the additional seednuts harvested.

5. **Mother palm seed supply :** 1,604,847 nuts were supplied to the Planting Division during the year.

6. **Isolated Seed Garden :** The Seed Garden and the Isolation Barrier of forest trees were maintained in good order throughout the year. 5,000 teak plants were planted in the barrier area vacated by the squatters. More teak will be planted as and when the Forest Department is able to supply the material. That portion of the barrier fence in the area vacated by the squatters was strengthened. The rest of the fence could not be strengthened last year due to the long delay experienced in getting material. Every effort is being made to maintain the barrier with efficiency as it is vital for the proper functioning of the Seed Garden.

7. The Division staff visited 6 estates for the selection of mother palms to enable the owners to select their own planting material.

8. **Personnel :** Mr. V. Dharmadasa, Field Assistant resigned to join the Land Commissioner's Department. Messrs. U.T.G. Fernando and Titus Perera, Field Assistants assumed duties on 1st November, '68.

R. B. RODRIGO  
Officer-in-charge,  
Botany Division.

# REPORT OF THE ACTING SOIL CHEMIST for the year 1968

## SUMMARY

### A. FIELD EXPERIMENTS :

The long term field experiments at Bandirippuwa, Ratmalagara, Bingiriya, Pothukulama, Walahapitiya, and Mawatte and the new experiments begun at Naiwala, Bingiriya, and Ratgama were maintained. The Observation trials on the problems of "leaf scorch" at Kirimetiya, yellowing at Iranaville, and immature nutfall at Palugaswetliya were continued.

Highly significant responses were obtained for potassium at Bandirippuwa and phosphorus at Ratmalagara. Significant interactions were NP and NK at Bandirippuwa, NP, PK at Ratmalagara.

On the coastal marine sandy soils at Iranaville quarterly applications of fertilizer have raised the yield of nuts ranging from 241 to 500%.

At Pothukulama phosphorus and potassium showed significant responses.

At Mawatte (lateritic soil), urea was found to be as good of source of nitrogen as sulphate of ammonia.

### B. LABORATORY INVESTIGATIONS :

Both in nut water and leaf samples from the 4 x 4 x 4 NPK experiment at Bandirippuwa the content of N,P,K, was raised by the supply of respective fertilizers.

Fertilizer placement studies with radioactive phosphorus showed that the best uptake took place when the placement was within a metre from the palm and the depth was not below 45 cms. from the surface.

## DETAILED REPORT

### C. SOIL SURVEYS :

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

Survey of lands in the Moneragala and Jaffna Districts were conducted for Government projects.

### A. Field Experiments

1. **4 x 4 x 4 NPK Experiment on Adult Palms—Bandirippuwa Estate.**  
(Details of Treatment and Design Appear in the Annual Report of the Coconut Research Institute for 1960).

The experiment completed nine years in November 1968 and the annual manuring was carried out in October 1968, the fertilizer being applied on the surface in the entire area within a radius of 6 feet from the palm and turned into the soil.

Potash continues to give a highly significant response. The response to phosphorus (at the rate of 1.5 lbs. P<sub>2</sub>O<sub>5</sub>) was significant at P 0.01 level. NP interaction was significant at P 0.05 and the NK interaction was significant at P 0.01. The main effects are shown in Table A 1 and the NP, NK. interactions in Table A 2.

**TABLE A1**

**Yield Data for 1968—4 x 4 x 4 NPK Experiment on Adult Palms**

**Bandirippuwa Estate**

**66 palms per acre**

**Copra yield adjusted by Co-variance Analysis**

Treatment (Annual)	lbs. Copra/Acre	%	Difference in lbs. Copra/Acre
N <sub>0</sub> (0.0 lbs. N)	1460	100	—
N <sub>1</sub> (0.5 lbs. N)	1560	106.8	100
N <sub>2</sub> (1.0 lbs. N)	1613	110.5	153
N <sub>3</sub> (1.5 lbs. N)	1530	104.8	70
P <sub>0</sub> (0.0 lbs. P <sub>2</sub> O <sub>5</sub> )	1455	100	—
P <sub>1</sub> (0.5 lbs. P <sub>2</sub> O <sub>5</sub> )	1525	104.8	70
P <sub>2</sub> (1.0 lbs. P <sub>2</sub> O <sub>5</sub> )	1528	105.0	73
P <sub>3</sub> (1.5 lbs. P <sub>2</sub> O <sub>5</sub> )	1656	113.8	201 **
K <sub>0</sub> (0.0 lbs. K <sub>2</sub> O)	1221	100	—
K <sub>1</sub> (0.5 lbs. K <sub>2</sub> O)	1540	126.1	319 **
K <sub>2</sub> (1.0 lbs. K <sub>2</sub> O)	1680	137.6	459 ***
K <sub>3</sub> (1.5 lbs. K <sub>2</sub> O)	1722	141.0	501 ***

Significant difference P 0.05 = 128.5 lbs. Copra/acre

\*Significant at P 0.05

\*\*Significant at P 0.01

\*\*\*Significant at P 0.001

**TABLE A2**

**Adjusted Interactions — lbs. Copra/Acre**

	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>
K <sub>0</sub>	1303	1131	1303	1148
K <sub>1</sub>	1510	1431	1535	1686
K <sub>2</sub>	1415	1857	1715	1733
K <sub>3</sub>	1614	1821	1898	1553
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>
N <sub>0</sub>	1269	1491	1408	1674
N <sub>1</sub>	1503	1634	1550	1553
N <sub>2</sub>	1606	1565	1644	1635
N <sub>3</sub>	1442	1410	1508	1759

## 2. Manurial x Cultivation Experiment—Ratmalagara Estate

(Details of Treatment and Design appear in CRI Annual Reports for 1959 and 1965).

The 25th year of the experiment ended in July 1968. Annual manuring was carried out in June 1968. The experimental treatments were modified in May 1965 and no significant change has been noticed.

## 3. 3 x 3 x 3 NPK Experiment on Young Palms — Ratmalagara Estate

(Details of treatment and design appear in CRI Annual Reports for 1959 and 1965)

The twentieth year of the experiment ended in December 1968. The 1967 manuring, postponed due to dry weather conditions, was carried out in March 1968. The 1968 manuring was completed in November 1968.

Response to phosphorus was highly significant and that to potassium was significant at the 0.01 level. NP and PK interactions were significant at the 0.05 level, both being positive.

The main effects of N,P,K, for 1968 are given in Table A 3 and the NP and PK interactions in Table A 4.

**TABLE A3**

**Yield Data for 1968 — 3 x 3 x 3 NPK Experiment on Young Palms**

**Ratmalagara Estate 52 palms/acre**

<i>Treatment Annual</i>	<i>lbs. Copra per acre</i>	<i>%</i>	<i>Difference lbs. Copra/Acre</i>	<i>Outturn Nuts/ Candy</i>
N <sub>0</sub> (1½ lbs. Ammonium Sulphate)	1885	100	—	1137
N <sub>1</sub> (3 lbs. Ammonium Sulphate)	1999	106	+114	1175
N <sub>2</sub> (4½ lbs. Ammonium Sulphate)	1908	101	+23	1223
P <sub>0</sub> (1 lb. Saphos Phosphate)	1578	100	—	1129
P <sub>1</sub> (2 lbs. Saphos Phosphate)	2119	134	+514 ***	1169
P <sub>2</sub> (3 lbs. Saphos Phosphate)	2095	133	+517 ***	1216
K <sub>0</sub> (1½ lbs. Muriate of Potash)	1807	100	—	1207
K <sub>1</sub> (3 lbs. Muriate of Potash)	1917	106	+110	1171
K <sub>2</sub> (4½ lbs. Muriate of Potash)	2069	114	+262 *	1152

Significant difference at P 0.05 = 149.5 lbs. Copra per acre.

\*Significant at 0.05

\*\*\* Significant at P 0.001

**TABLE A 4**

	lbs. Copra/acre		
	$P_0$	$P_1$	$P_2$
$K_0$	1555	1866	1994
$K_1$	1483	2130	2135
$K_2$	1691	2360	2155
$N_0$	1680	2037	1937
$N_1$	1567	2258	2152
$N_2$	1487	2061	2177

4. 4 x 4 x 4 x NPK Experiment on Young Palms—Pothukulama Research Station.

(Details of design and treatment appear in CRI Annual Reports for 1961 and 1963)

The experiment completed 8 years in 1968. The annual manuring was done in October 1968.

By the end of 1968 96% of the palms had come into flower. Phosphorus and potassium showed significant response, at P 0.05 level.

**TABLE A 5**

**Yield Data for 1968—4 x 4 x 4 NPK Experiment on Young Palms—Pothukulama Research Station**

	72 Palms/acre		
Treatment	lbs. Copra/acre	%	Difference in lbs. Copra/acre
$N_0$	1269	100	—
$N_1$	1388	109.4	+119
$N_2$	1336	105.3	+67
$N_3$	1302	102.6	+33
$P_0$	1161	100	—
$P_1$	1335	115.0	+174
$P_2$	1367	117.7	+206
$P_3$	1433	123.4	+272
$K_0$	1134	100	—
$K_1$	1331	117.4	+197
$K_2$	1419	125.1	+285
$K_3$	1412	124.5	+278

5. **Experiment on Quality of Nitrogen and Phosphorus and Frequency of Manuring (Pothukulama Research Station).**

(Details of design and treatment are given in CRI Annual Report for 1967).

The manuring due in December 1967 but postponed owing to the necessity to remove heavy weeds was carried out in January 1968. The annual and biennial manurings were duly done in June 1968 and December 1968.

Leaf counts and the height of the youngest fully opened leaf from the ground were taken in May 1968.

6. **Manurial Experiment on Organics Vs. Inorganics and Frequency of Manuring. (Co-Operative Experiment at Marandawila Estate, Bingiriya).**

(Details of Treatment and Design appear in CRI. Annual Reports for 1959, 1964 and 1965).

Nine years of the experiment ended in June 1968. The annual plots were manured in May 1968.

No significant difference was shown between organic and inorganic fertilizers nor between annual and biennial manuring.

The yield data for the year is presented in Table A 6.

**TABLE A 6**

**Yield Data for the year ending June 1968—Experiment on Organics Vs. Inorganics, Marandawila Estate.**

**Copra yields adjusted by Covariance analysis—60 palms/acre**

	<i>lbs. Copra/acre</i>	<i>Difference in lbs. Copra/acre</i>	<i>Copra outturn Nuts/Candy</i>
Control ... ..	1437	—	1196
Inorganics Annually ... ..	2041	604	1143
Inorganics Biennially ... ..	1928	491	1085
Organics Annually ... ..	2047	610	1089
Organics Biennially ... ..	1901	464	1156
Cattle manure supplemented	2075	638	1128

5. **Method of Placement and Liming Experiment on Adult Palms-Walahapitiya Estate, Nattandiya.**

(Details of treatment and Design appear in CRI. Annual Reports for 1961 and 1965).

The experiment has been carried on for seven years and the annual manuring was carried out in November 1968. No lime was applied in 1968. Soil samples were taken from the limed plots in May 1968 and pH determined. The pH value ranged from 4.30 to 7.16 for the top soil (0-9") and 4.34 to 6.10 for the subsoil (9-18") - Table A 8.

The response to liming just reached significance. At the higher level of fertilizer (F<sub>2</sub>) the methods of placement C and S showed superior to broadcast application.

The yield data for the year 1968 are recorded in Table A 7.

**TABLE A 7**

**Yield Data for 1968—Experiment on Fertilizer Placement and Liming—Walahapitiya Estate**

(Yields Adjusted by Covariance Analysis) 50 Palms/acre

<i>Treatment</i>	<i>lbs. copra/acre</i>	<i>%</i>	<i>Difference in lbs. Copra/acre</i>
O (No fertilizers)	851	100	—
B (Broadcast)	1267	148.9	+416 ***
C (Surface application up to 6 ft. from base)	1356	159.3	+505 ***
S (Surface application in circular strips)	1310	153.9	+459 ***
Significant difference P 0.05 = 81.8 lbs./acre.			
*** Significant at P 0.001.			
L <sub>0</sub> (No lime)	1136	100	—
L <sub>1</sub> (Lime)	1256	110.6	+120 *
Significant difference P 0.05 = 120 lbs. Copra/acre.			
O (No fertilizer)	851	100	—
F <sub>1</sub> (3½ lbs. NPK Mixture)	1153	135.5	+302
F <sub>2</sub> (7 lbs. NPK Mixture)	1469	172.6	+618
	F <sub>1</sub>	F <sub>2</sub>	
O (No fertilizer)	836	865	
B (Broadcast)	1164	1369	
C (Surface application up to 6 ft. from base)	1172	1540	
S (Surface application in circular strips)	1123	1497	

**TABLE A 8****pH of Soils****EXPERIMENT ON FERTILIZER PLACEMENT AND LIMING  
WALAHAPITIYA ESTATE**

Sample	pH	
	Top Soil (0-9")	Sub-Soil (9-18")
1.4	7.16	6.08
5.8	4.36	4.46
9.12	4.56	4.72
13.16	7.00	5.86
17.20	6.80	5.68
21.24	4.40	4.58
25.28	4.52	4.56
29.32	6.48	6.10
33.36	4.30	4.34
37.40	6.46	5.82
41.44	6.68	5.88
45.48	4.48	4.71

The last application of lime was done in October 1966. pH measurements done in July 1967 showed that the values ranged from 7.16 to 11.32 for the top soil (0-9") and 6.05 to 8.08 for the sub-soil (9-18"). No lime was applied in 1967 and 1968. To the end of 1966 the limed plots have received a total of 4 $\frac{3}{4}$  tons of lime per acre.

**8. Experiment on Quality of Nitrogen and Frequency of Manuring (Mawatte Estate, Dankotuwa, Co-operative Experiment).**

(Details of treatment and design appear in the CRI Annual Report for 1964).

Four years of the experiment ended in December 1968. The half yearly and annual manuring was done in June and December 1968 respectively.

As yet no significant difference between the different treatments has been shown.

**9. 5x5x5 NPK Experiment on Adult Palms (Naiwala Estate, Veyangoda, Co-operative Experiment).**

(Details of treatment and design appear in the CRI Annual Report for 1967).

The experiment completed an year and the annual manuring was done in July 1968.

**10. 5x5x5x5 NPK Mg Experiment on Adult Palms (Marandawila Estate, Bingiriya, Co-operative Experiment).**

(Details of treatment and design appear in the CRI Annual Report for 1967).

An year of the experiment has been completed and the annual manuring was carried out in November 1968.

11. **5×5×5×5× NPK Mg Experiment on Adult Palms (Monrovia Estate, Rathgama, Co-operative Experiment).**

(Details of design and treatment appear in the CRI Annual Report for 1967).

An year of the experiment has been completed and the annual manuring was done in November, 1968.

12. **5×5×5 B Zn S Experiment on Adult Palms (Monrovia Estate, Rathgama, Co-operative Experiment).**

The object of the experiment is to determine the yield response curves of adult coconut palms to the application of Boron, Zinc, and Sulphur for assessing their optimum levels of applications under the soil (lateritic) and climatic (wet zone) conditions prevalent at Monrovia Estate which is typical of coconut lands in the Galle district.

The experimental design consists of a central composite rotatable second order design. There are 15 plots of 18 palms each.

All plots are given a uniform annual treatment of 3 lbs. muriate of potash (60% K<sub>2</sub>O), 3 lbs. Saphos phosphate and 3 lbs. urea per palm. Each of the factors B as Sodium borate, Zn as Zinc chloride, and S as elemental sulphur will be tested at the 5 different levels given below :

The rates per palm per annum are :

			<i>lbs. Sodium Borate</i>				<i>lbs. Zinc Chloride</i>
B <sub>0</sub>	...	...	0	Zn <sub>0</sub>	...	...	0
B <sub>1</sub>	...	...	½	Zn <sub>1</sub>	...	...	½
B <sub>2</sub>	...	...	1	Zn <sub>2</sub>	...	...	1
B <sub>3</sub>	...	...	1½	Zn <sub>3</sub>	...	...	1½
B <sub>4</sub>	...	...	2	Zn <sub>4</sub>	...	...	2
 <i>lbs. Sulphur</i>							
			S <sub>0</sub>	...	...	0	
			S <sub>1</sub>	...	...	2½	
			S <sub>2</sub>	...	...	5	
			S <sub>3</sub>	...	...	7½	
			S <sub>4</sub>	...	...	10	

Leaf samples were taken from all the plot palms in March 1968, the 14th leaf, taking the youngest fully opened leaf as 1, being sampled.

The first differential manuring was done in June 1968.

13. **"Leaf Scorch" Problem, Gonapinuwela Area, (See also CRI, Annual Reports for 1961 to 1964).**

The two groups of healthy (220) and affected (220) palms were continued to be treated with the different combinations of nutrients (see Annual Report for 1965). The recording of nuts and female flowers was maintained.

Out of the original group of 220 healthy palms 4 were lost - one blown down by wind, one struck by lightning, and two due to leaf scorch. 87 more palms showed symptoms of leafscorch. Drought prevailed during the year and this may partly account for the large number of palms which showed symptoms of leaf scorch.

From the original group of 220 affected palms 7 more palms died during the year, making the total of palms dead to date 34. No signs of improvement were noticed. However the yield from both groups of palms remain unchanged since 1966. The yields per palm for the 5 years 1964-1968 are as follows :

		1964	1965	1966	1967	1968
Affected palms	...	38	43	28	25	25
Healthy palms	...	65	84	75	71	72

#### 14. Observation Trials on Nitrogen Quality (Iranaville Estate, Chilaw)

(See CRI. Annual Reports for 1965 and 1966)

To date ten quarterly applications of the different combinations of fertilizers have been made. This year too increases in production of female flowers, nuts, and copra have been recorded. The following increases over the premanurial figures have been obtained : female flowers, 402 to 2,751 per cent ; nuts 241 to 500 per cent ; and copra 223 to 419 per cent. Table A 9 gives the data on female flowers, nuts, and copra for the pre-manurial year, 1967 and 1968.

**TABLE A 9**

#### Yield Data Per Palm—Iranaville Estate—Chilaw

Treatment	FEMALE FLOWERS			NUTS			COPRA (lbs.)		
	Pre-Manurial	1967	1968	Pre-Manurial	1967	1968	Pre-Manurial	1967	1968
1	9	27	90	7	15	31	3	7	13
2	11	26	105	6	16	33	4	7	13
3	10	24	65	14	18	33	6	8	14
4	12	36	90	12	20	36	6	8	15
5	11	27	117	11	16	41	5	7	16
6	14	23	58	13	15	32	6	7	14
7	14	29	87	7	15	27	4	6	11
8	12	47	113	9	13	24	4	5	10
9	15	34	84	9	17	33	4	7	14
10	8	30	227	6	11	31	3	4	12

#### 15. Observation Trial on Immature Nutfall (Palugaswetiya Estate, Weerapokuna.)

The treatments were continued during the year. The immature nutfall data for the years 1965, 1966, 1967, and 1968 are presented in Tables A 10 and A 11.

**TABLE—A 10 Immature Nutfall (Healthy Palms)—Total of 5 Palms.**

**TABLE—A 11 Immature Nutfall (Nutfall Palms)—Total of 25 Palms.**

TREATMENT	PRE-TREATMENT YEAR 1		PRE-TREATMENT YEAR 2		1967		1968	
	Fit for Copra	Unfit for Copra	Fit for Copra	Unfit for Copra	Fit for Copra	Unfit for Copra	Fit for Copra	Unfit for Copra
CRI "C" MIXTURE 10 lbs.	3	7	2	17	—	21	1	9
Barium Nitrate 3 lbs.	1	3	5	1	2	15	2	7
Strontium Nitrate 3 lbs.	1	4	1	4	2	25	1	1
Barium Nitrate 2 lbs. + Strontium Nitrate 2 lbs.	20	3	7	4	—	20	17	20
Gypsum 20 lbs.	3	7	15	10	—	49	6	3
<b>TABLE A II</b>								
CRI "C" MIXTURE 10 lbs. ...	696	968	850	857	496	465	729	946
CRI "C" MIXTURE 10 lbs. ... + MURIATE OF POTASH (60%) 10 lbs.	777	1864	731	1387	666	801	655	2146

TABLE-B I

4×4×4 NPK Experiment on Adult Palms—Bandirippuwa Estates

Analysis of 14th Leaf Samples  
% Element on Oven-Dry Basis

Treatment	N	%	P	%	K	%	Ca	%	Mg	%
N <sub>0</sub>	1.923	100	0.128	100	0.502	100	0.297	100	0.373	100
N <sub>1</sub>	2.056	106.9	0.127	99.2	0.401	79.9	0.362	121.9	0.426	114.2
N <sub>2</sub>	2.055	106.9	0.125	97.7	0.375	74.7	0.348	117.2	0.399	107.0
N <sub>3</sub>	2.159	112.3	0.125	97.7	0.413	82.3	0.359	120.9	0.363	97.3
P <sub>0</sub>	2.043	100	0.121	100	0.446	100	0.295	100	0.389	100
P <sub>1</sub>	2.097	102.6	0.129	106.6	0.408	91.5	0.311	105.4	0.394	101.3
P <sub>2</sub>	1.990	97.4	0.127	104.95	0.406	91.0	0.390	132.2	0.384	98.7
P <sub>3</sub>	2.063	100.97	0.128	105.08	0.431	96.6	0.370	125.4	0.395	101.5
K <sub>0</sub>	2.064	100	0.121	100	0.179	100	0.377	100	0.470	100
K <sub>1</sub>	2.059	99.7	0.127	104.95	0.283	158.1	0.322	85.4	0.414	88.1
K <sub>2</sub>	2.041	98.9	0.129	106.6	0.490	273.7	0.354	93.9	0.344	73.2
K <sub>3</sub>	2.092	101.4	0.128	105.8	0.739	412.8	0.312	82.8	0.330	70.2

## B. LABORATORY INVESTIGATIONS

### LEAF AND NUT WATER ANALYSIS

#### 4 x 4 x 4 NPK Experiment on Adult Palms, Bandirippuwa Estate.

Leaf samples were taken in April 1967 from the 4 x 4 x 4 NPK experiment on adult palms at Bandirippuwa Estate. From each of the 18 palms in a plot the 14th leaf was cut down. From the mid-region of each leaf 3 leaflets from either side of the rachis were removed. The mid-rib from each leaflet was taken off and about 2 inches of the lower end of each leaflet was rejected. From the balance pieces of about 10 inches long were taken for the samples. The pieces so removed formed a composite sample. The samples were dried in a dehydrator, ground to powder and analysed. The results are recorded in Table B1.

Nut water sampled from nuts picked at the same time as the leaf sampling was analysed for N, P, and K. 100 nuts from each plot were split and the water bulked. The analytical sample was taken from this bulked water. The results are given in Table B 2.

TABLE — B 2

### NUT WATER ANALYSIS

#### 4 x 4 x 4 NPK EXPERIMENT — BANDIRIPPUWA ESTATE

Treat- ment	N	%	P <sub>2</sub> O <sub>5</sub>	%	K <sub>2</sub> O	%
	mg/lit.		mg/lit.		g/lit.	
N <sub>0</sub>	238	100	260.3	100	1.72	100
N <sub>1</sub>	240	100.84	271.3	104.23	1.69	98.26
N <sub>2</sub>	236	99.16	264.8	101.73	1.50	87.21
N <sub>3</sub>	245	102.94	258.2	99.19	1.50	87.21
P <sub>0</sub>	235	100	235.8	100	1.64	100
P <sub>1</sub>	242	10.29	266.2	112.89	1.49	90.85
P <sub>2</sub>	242	10.29	274.4	116.37	1.54	93.90
P <sub>3</sub>	237	10.085	273.1	115.82	1.74	106.10
K <sub>0</sub>	228	100	255.2	100	1.04	100
K <sub>1</sub>	240	105.26	270.1	105.84	1.10	105.77
K <sub>2</sub>	245	107.46	263.3	103.17	1.94	186.54
K <sub>3</sub>	244	107.02	262.6	102.90	2.33	224.04

Both in the leaves and nut water the content of N,P and K has risen with the levels in the supply of the respective fertilizers. This is similar to the yield response. (Table B3)

**TABLE B.3**

**COPRA YIELDS IN lbs./ACRE FOR 1968**

**4 x 4 x 4 NPK Experiment on Adult Palms—Bandirippuwa Estate**

<i>Treatment</i>	<i>lbs. Copra/Acre</i>	<i>%</i>
N <sub>0</sub>	1460	100.0
N <sub>1</sub>	1560	106.8
N <sub>2</sub>	1613	110.5
N <sub>3</sub>	1530	104.8
P <sub>0</sub>	1455	100.0
P <sub>1</sub>	1525	104.8
P <sub>2</sub>	1528	105.0
P <sub>3</sub>	1656	113.8**
K <sub>0</sub>	1221	100.0
K <sub>1</sub>	1540	126.1**
K <sub>2</sub>	1680	137.6***
K <sub>3</sub>	1722	141.0***

\*\*Significant at P 0.01

\*\*\*Significant at P 0.001

In the leaves addition of (i) nitrogen reduced the content of phosphorus and potassium but increased the content of calcium and magnesium, (ii) phosphorus raised the level of nitrogen, calcium and magnesium while decreasing the level of potassium, (iii) potassium was synergistic to phosphorus and antagonistic to nitrogen, calcium and magnesium.

In the nut water supply of (i) nitrogen raised the level of phosphorus and reduced that of potassium, (ii) phosphorus increased the content of nitrogen and lowered that of potassium (iii) potassium increased the content of both nitrogen and phosphorus.

**2. Leaf Analysis — 5 x 5 x 5 NPK Experiment on Adult Palms—Naiwala Estate, Veyangoda.**

Leaf samples were taken in March 1967, prior to the first differential manuring. The collection and preparation of samples for analysis was similar to that described in the preceding section.

The results are presented in Table B4.

**TABLE B 4**

**LEAF ANALYSIS (14th LEAF)**

**5 x 5 x 5 NPK Experiment, Naiwala Estate, Veyangoda.**

Plot	% of N O.D.S.	% of P O.D.S.	% of K O.D.S.	% of Ca O.D.S.	% of Mg. O.D.S.
1	1.980	0.1371	0.8702	0.3126	0.1518
2	1.988	0.1406	0.8802	0.2044	0.1596
3	1.916	0.1338	0.6639	0.2785	0.2182
4	1.960	0.1331	0.8303	0.2402	0.2032
5	1.954	0.1361	0.8721	0.2314	0.1673
6	1.936	0.1395	0.7044	0.2859	0.2086
7	1.920	0.1341	0.7869	0.2816	0.1948
8	1.940	0.1332	0.7057	0.2865	0.1671
9	1.827	0.1294	0.8155	0.2966	0.2012
10	1.914	0.1339	0.7009	0.1766	0.1458
11	1.912	0.1297	0.6744	0.1687	0.1779
12	1.916	0.1328	0.7874	0.1873	0.1383
13	1.949	0.1338	0.7003	0.2462	0.1456
14	1.840	0.1364	0.7626	0.2228	0.1399
15	1.943	0.1321	0.6839	0.2141	0.1571

**3. Radio Isotope Studies on Efficiency of Fertilizer Utilization by Coconut Palms (in Co-operation with the International Atomic Energy Agency).**

Pursuant to the contracts concluded with the International Atomic Energy Agency two experiments were carried out during the year, on a sandy loam soil at Marandawila Estate, Bingiriya. The first experiment was conducted in January 1968 during the dry season and the second in October 1968 during the wet season.

Forty eight palms of very nearly the same age and vegetative growth, grouped into three blocks, were selected. Each palm selected for treatment was surrounded by untreated palms.

The treatments consisted of all combinations of four distances and four depths. Each treatment was replicated three times. The distances of placement were 0.5, 1.0, 2.0, and 3.0 metres and the depths 10, 30, 45, and 60 centimetres.

Radioactive phosphorus was placed at the appropriate depth in sixteen equally spaced points round the palm at the appropriate distance.

Leaflets were taken from the sixth frond of each treated palm 10, 20, 30 and 40 days after the application of radioactive phosphorus. The leaflet samples were dry ashed and extracted with 2 N HCl. Radioactivity was determined by the liquid counting technique and total phosphorus by the colorimetric vanado-molybdate method.

The experimental results are summarized in Table B5 and B6. Of the sixteen treatments, uptake from placement at a depth of 10 cms. distant 0.5 metres from the palm was the most efficient. The uptake from placements at 30 cms. and 45 cms. depths indicates that though the initial uptake is small it increases with time and after a sufficiently long time the uptake is greater than that from placement at 10 cms. depth.

TABLE B 5

## MEAN SPECIFIC ACTIVITY OF LEAF SAMPLES (6th LEAF)

Counts per min. per mg P.

Distance of Placement Metres	10TH DAY SAMPLES					23RD DAY SAMPLES					30TH DAY SAMPLES					40TH DAY SAMPLES				
	10 cms.	30 cms.	45 cms.	60 cms.	Total	10 cms.	30 cms.	45 cms.	60 cms.	Total	10 cms.	30 cms.	45 cms.	60 cms.	Total	10 cms.	30 cms.	45 cms.	60 cms.	Total
0.5	6.40	2.43	0.19	0.20	9.22	8.94	8.81	4.32	2.59	24.66	9.73	11.47	6.29	3.34	30.83	11.83	13.61	8.97	5.43	39.84
1.0	5.63	0.72	2.77	0.54	9.66	5.12	4.78	5.25	2.24	17.39	5.13	3.72	6.46	3.45	18.76	5.32	5.04	9.88	5.42	25.66
2.0	2.17	2.75	0.17	0.29	5.38	2.33	4.19	0.83	1.23	8.58	2.43	4.95	1.14	1.43	9.95	2.54	5.65	1.66	2.50	12.35
3.0	1.08	0.29	0.92	0.17	2.46	1.14	0.65	2.50	0.62	4.91	1.28	0.76	2.33	0.87	5.24	0.85	0.74	3.52	1.29	6.40
Total	15.28	6.19	4.05	1.20	26.72	17.53	18.43	12.90	6.68	55.54	18.57	20.90	16.22	9.09	64.78	20.54	25.04	24.03	14.64	84.25

## ANALYSIS OF VARIANCE

Source	10TH DAY SAMPLES				23RD DAY SAMPLES			30TH DAY SAMPLES			40TH DAY SAMPLES		
	D.F.	S.S.	M.S.	F	S.S.	M.S.	F	S.S.	M.S.	F	S.S.	M.S.	F
Between Reps.	1	2.55	2.55	1.17	25.35	25.35	4.01	51.66	51.66	4.98	81.86	81.86	5.11
Between Distance	3	17.39	5.80	2.66	69.61	23.20	3.67*	121.05	40.35	3.89*	201.18	67.07	4.18*
Between Depths	3	55.61	18.54	8.50***	48.65	16.22	2.56	64.68	21.56	2.08	86.62	28.87	1.80
Distance x Depth	9	41.53	4.61	2.11	82.02	9.11	1.44	116.97	13.00	1.25	168.00	18.67	1.16
Error	15	32.66	2.18		94.91	6.33		155.71	10.38		240.00	16.03	
Total	31	149.74	4.83		320.54	10.34		510.07	16.45		778.05	25.10	
C.F.			88.98			334.63			510.56			808.82	

\* Significant at P 0.05

\*\* Significant at P 0.01

## VARIATION OF UPTAKE WITH DISTANCE OF PLACEMENT AND TIME

Distance of Placement Metres	SPECIFIC ACTIVITY PER PALM							
	EXPERIMENT 1 Counts per min. per mg P				EXPERIMENT 2 Counts per Min. Per Gram Dry Matter			
	10th Day	23rd Day	30th Day	40th Day	10th Day	20th Day	30th Day	40th Day
0.5	2.30	4.88	6.34	7.41	34.15	96.36	176.85	242.61
1.0	2.41	4.37	5.32	7.38	36.32	100.93	181.90	249.38
2.0	1.34	2.48	2.91	3.55	11.96	36.07	62.38	90.52
3.0	0.61	1.20	1.41	1.67	5.68	16.90	29.31	44.27

For all distances of placement the uptake increased with time. This increase is greater for placements close to the palm than for distant placements.

## VARIATION OF UPTAKE WITH DEPTH OF PLACEMENT AND TIME

Depth of Placement Cms.	SPECIFIC ACTIVITY PER PALM							
	EXPERIMENT 1 Counts Per Min. Per mg P				EXPERIMENT 2 Counts Per Min. Per Gram. Dry Matter			
	10th Day	23rd Day	30th Day	40th Day	10th Day	20th Day	30th Day	40th Day
10	3.82	4.27	4.54	4.54	51.95	125.86	206.59	301.54
30	1.55	3.95	5.18	6.12	17.32	60.45	119.07	155.13
45	1.01	3.58	4.69	6.87	11.20	40.48	82.37	114.82
60	0.30	1.14	1.57	2.58	7.64	23.47	41.58	55.28

The uptake on the early dates of sampling (10th and 20th day) is better from depths of placement close to the surface than deeper placements. But with the passage of time uptake from deeper placements (not below 45 cms.) is as good as, if not better than, from placements close to the surface.

**TABLE B 6**

**Isotope Studies on Efficiency of Fertilizer Utilization**

**Mean Count per min. per Gram DRY MATTER**

Distance of Placement (Metres)	10TH DAY					20TH DAY					30TH DAY					40TH DAY				
	10	30	45	60	Total	10	30	45	60	Total	10	30	45	60	Total	10	30	45	60	Total
0.5	68.9	31.7	23.8	12.2	136.6	164.4	108.1	74.7	38.3	385.5	267.5	213.7	151.1	71.7	704.0	395.7	298.3	183.8	92.6	970.4
1.0	96.0	25.2	14.5	9.5	145.2	225.5	90.8	60.7	26.7	403.7	373.3	182.2	127.0	45.1	727.6	540.0	203.7	189.1	64.5	997.3
2.0	30.9	7.6	2.4	6.9	47.8	85.3	28.5	9.8	20.6	144.2	137.8	55.4	19.5	36.8	249.5	199.7	85.1	31.0	46.3	362.1
3.0	12.0	4.7	4.1	1.9	22.7	28.3	14.4	16.7	8.2	67.6	47.8	24.9	31.9	12.7	117.3	70.8	33.1	55.4	17.8	177.1
Total	207.8	69.2	44.8	30.5	352.3	503.5	241.8	161.9	93.8	1001.0	826.4	476.2	329.5	166.3	1798.4	1206.2	620.2	459.3	221.2	2506.9

**ANALYSIS OF VARIANCE**

Source	10TH DAY				20TH DAY				30TH DAY				40TH DAY			
	D.F.	S.S.	M.S.	V.R.	D.F.	S.S.	M.S.	V.R.	D.F.	S.S.	M.S.	V.R.	D.F.	S.S.	M.S.	V.R.
Replicates	2	357.14			2	2032.41			2	20951.27			2	29401.54		
Distances	3	8635.86	2878.62	5.54**	3	64818.87	21606.29	7.11***	3	219408.67	73136.22	8.79***	3	395903.16	131967.72	6.96***
Depths	3	14900.81	4966.94	9.57***	3	72321.59	24107.20	7.94***	3	178016.36	59338.79	7.13***	3	396253.40	132084.47	6.97**
Dist. x Depths	9	6806.78	756.31	1.46	9	32590.75	3621.19	1.19	9	87577.76	9730.86	1.17	9	191620.16	21291.13	1.12
Error	30	15577.78	519.26		30	91114.53	3037.15		30	249641.54	8321.38		30	568653.69	18955.12	
Total	47	46278.37			47	262878.15			47	755595.60			47	1581831.95		
Correction Factor		23289.24				C.F. 187887.70				C.F. 606420.48				C.F. 1178540.70		
Coefficient of variation		= $\frac{22.7872 \times 100}{22.0271} = 103.45\%$				C.V. = $\frac{55.1103 \times 100}{62.5646} = 88.09\%$				C.V. = $\frac{91.2216 \times 100}{112.4000} = 81.16\%$				C.V. = $\frac{137.6776 \times 100}{156.6938} = 87.86\%$		

\*\* Significant at P 0.01  
 \*\*\* Significant at P 0.001

## VARIATION OF UPTAKE WITH DISTANCE AND DEPTH OF PLACEMENT AND TIME

PLACEMENT	COUNTS PER MIN. PER mg. P (EXPERIMENT I)			
	10th Day	23rd Day	30th Day	40th Day
Shallow-near ...	3.8	5.8	6.9	7.6
Deep-near ...	0.9	3.5	4.8	7.3
Shallow-Distant ...	1.6	2.4	2.8	3.1
Deep-Distant ...	0.4	1.3	1.5	2.2

On grouping the distances of placement as "near" (0.5 and 1.0 meters) and "distant" (2.0 and 3.0 meters) and the depths of placement as "shallow" (10 and 30 cms.) and "deep" (45 and 60 cms.) a clear pattern of uptake emerges. For about ten days the uptake from shallow placements, whether "near" or "distant" is better than from "deep" placements. However, with time, the uptake from even "deep" placement (not below 45 cms.) "near" to the palm reaches almost the same level as from "shallow-near" placement. With "distant" placements whether "shallow" or "deep", the uptake is lower than "near" placement.

The various patterns of uptake are illustrated in figures 1, 2 and 3.

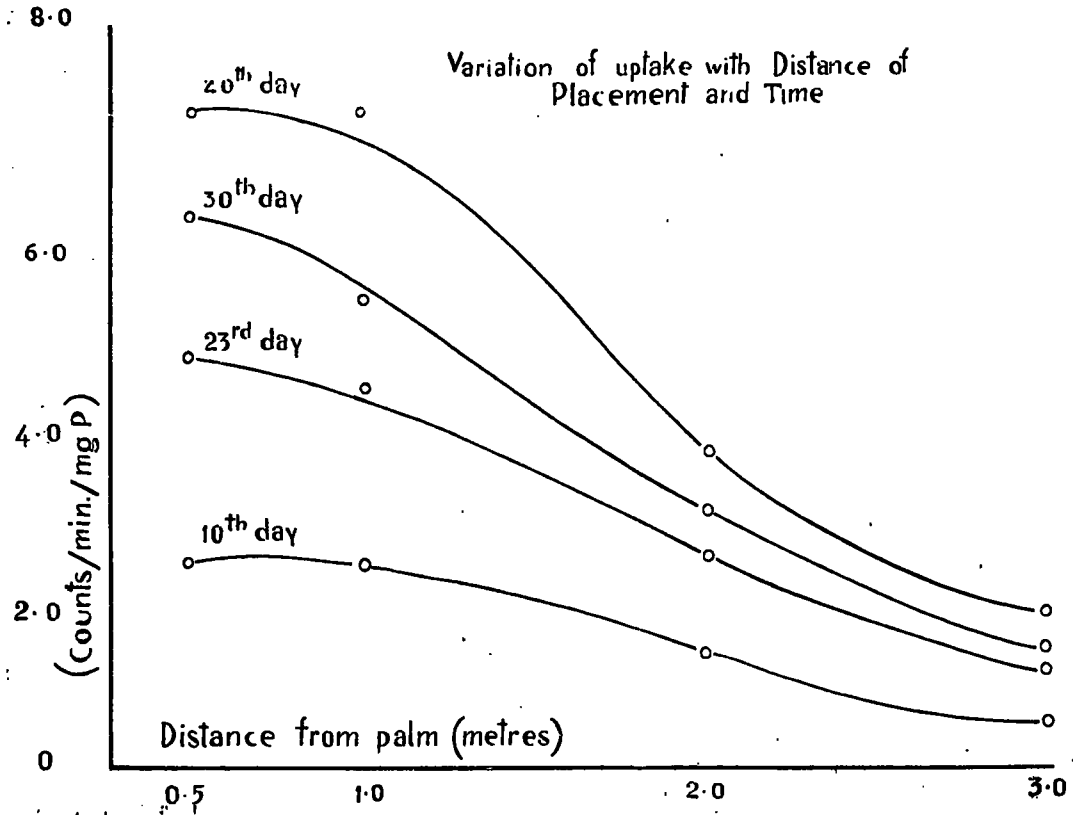


FIGURE 1

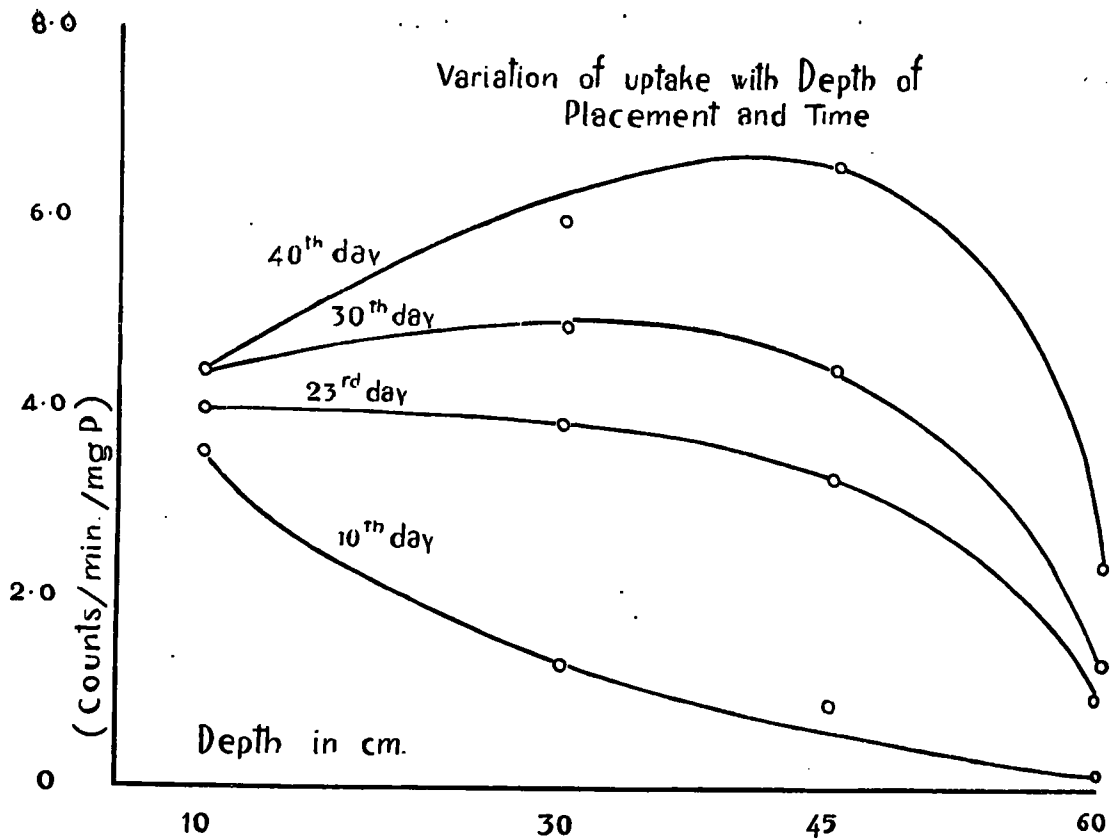


FIGURE II

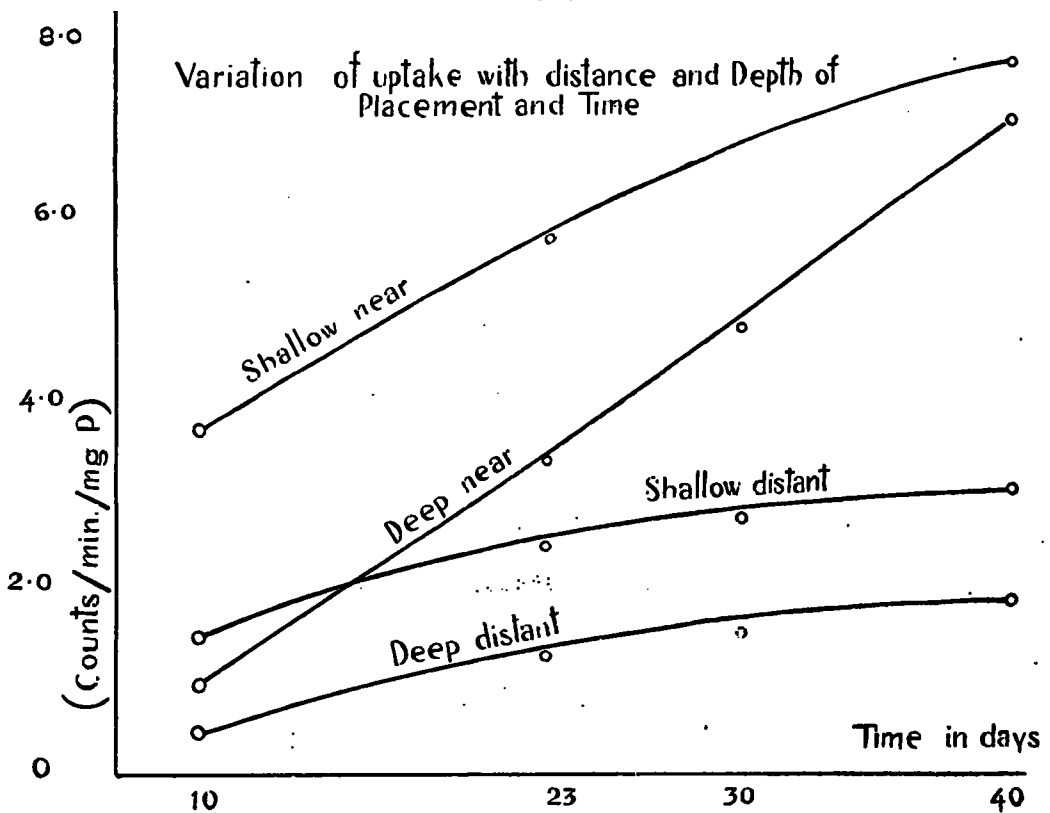


FIGURE III

## C. SOIL SURVEYS

### Report Submitted by Mr. K. S. O. Perera, Technical Assistant, Soil Survey Unit.

The regional soil survey of the Eastern Province was continued, the Batticaloa and Kalkudah 1" sheets being fully completed, while work was commenced on the Kalmunai and Tirrukovil 1" sheets.

Two major soil surveys were carried out for Government projects, the survey of lands in the Moneragala and Jaffna Districts.

A detailed soil survey was commenced in the Ambalangoda 1" sheet in the "leaf scorch" affected areas.

### Regional Soil Survey of the Eastern Province

Climate, vegetation, landforms and geology of the region has been described in earlier reports.

The soils have been classified into the series developed in the Reddish Brown Earths, and the Non-Calcic Brown Soils in the Interior regions, the lagoon clays in the lagoon clay plains, and coastal sands of the great coastal sand plain.

Since the coconut lands are mainly present in the coastal sands, work is being carried out to classify the sands in relation to topography and moisture regimes. Wet sands are mainly concentrated in the depressions of the sand plain, and have a relationship to subsurface drainage. The work is being continued.

Detailed soil survey of areas affected with "Leaf Scorch Decline Disease" in the Ambalangoda 1" sheet.

**Physiography and Geology** — The landform consists of a rolling and undulating system of hills of low elevation, hill slopes and valleys.

The predominant rocks in the area consist of Charnokites. Soils in the hills and slopes are developed in the lateritic soils of the Baddegama series and the valleys are built-up of transported soils.

In the Baddegama series the following types and phases were studied.

Type Lateritic—phase  $HP_1$ .—Here the hardpan is between 0—10".

Type Lateritic—phase  $HP_2$ .—Hardpan between 10"—20" In both phases, disease incidence high.

Type Lateritic— $HP_\alpha$ .—Here the hardpan is absent

These consist of 2 phases type lateritic  $HP_{\alpha_1}$ .—Red soils

Type lateritic  $HP_{\alpha_2}$ .—Yellow soils. Disease incidence—nil.

### Soils of the Valleys—(upper floor),

(A) Non-lateritic, deep well drained (WD types)  
Disease incidence—nil.

(B) Soils of the valleys (bottom floor).

Non-lateritic. Imperfectly and poorly drained types. (ID and PD types).<sup>7</sup>

The following phases are present WT<sub>1</sub>, water table 0-10"

WT<sub>2</sub> (water table 10"-20")

WT<sub>3</sub> (water table 20"-30")

WT<sub>4</sub> (water table 30"-40")

In the above phases the disease incidence is high.

The above soil survey is still proceeding.

#### **Soil Survey of lands in the Jaffna District.**

*D.R.O. Division Pallai—Urvannikkan Pattu—(250 acres)*

Soils are deep well drained yellowish loamy sands. Most soils up to 1/8 miles round sink holes are clayey.

*D.R.O. Division Killinochchi. (Elephant Pass N.W. 2100 acres)*

The soils belong to the same type as above.

*D.R.O. Division Poonakary. (Netpularvu 300 acres, Nachikuda 100 acres).*

The soils are dry sands.

*D.R.O. Division—Chavakachcheri—Kallikaraikadu*

The soils are lagoon clays, and not suitable for coconut cultivation.

#### **Soil survey of lands in the Moneragala District**

The soil survey of lands in the Bible, and Mahaoya D.R.O. Divisions was completed and work in the Wellawaya D.R.O. Division is being continued.

*Mahaoya D.R.O. Division.—Ellegoda (1000 acres Mahaoya 1" Sheet), Omuna (1000 acres, Rukam 1" sheet).*

The deep, well drained yellowish brown sandy clay loams are suitable for coconut cultivation.

*Bible D.R.O. Division (Passara 1" sheet) Puranwella (250 acres). Yellowish brown, deep sandy clay loams.*

*Dambugalla (Passara 1" Sheet) Shallow grassland soils with sheet rock outcrops. Soils are not suitable for coconut cultivation.*

*Wellawaya D.R.O. Division. Work is being continued.*

**Miscellaneous Soil Surveys :** Soil Surveys were carried out on a very limited scale in uneconomic rubber and tea lands in the following estates.

1. Gollinda Estate, Kegalle.
2. Rye Estate, Balangoda.
3. Pindeniyaya Estate, Kegalle.
4. Gamawella Estate, Passara.

## **D. MISCELLANEOUS**

Mr. T. S. Balakrishnamurti attended a meeting of the contractors in the co-ordinated programme on the use of isotopes to study the efficient use of fertilizers in tree culture held in Vienna in July 1968 and organised jointly by the Food and Agricultural Organization and the International Atomic Energy Agency.

Mr. T. S. Balakrishnamurti presented a paper on ISOTOPE STUDIES ON EFFICIENCY OF FERTILIZER UTILIZATION BY COCONUT PALMS at the 24th Annual Session of the Ceylon Association for the Advancement of Science.

## **E. PERSONNEL :**

Mr. M. A.T de Silva, Senior Technical Assistant, who is undergoing training in trace element analysis at Long Ashton Research Station, Bristol, England, was granted an extension of six months for his studies.

Mr. D. M. Selvanayagam, resigned from his post of Technical Assistant in November 1968.

Mr. M. Alexander Paris assumed duties as Laboratory and Field Attendant in April 1968.

Mr. D. S. Wijetunge was promoted as Laboratory and Field Assistant with effect from October 1968.

**T. S. BALAKRISHNAMURTI**  
*Acting Soil Chemist.*

## REPORT OF THE OFFICER-IN-CHARGE, AGROSTOLOGY DIVISION, for the year 1968

**General**—During the year under review a unit was set up to carry out chemical analysis of pasture samples.

Weed control studies in coconut lands formerly undertaken by the Crop Protection Division was handed over to this Division during the year. However due to lack of staff no work was undertaken during the year.

Three Jersey bull calves were bought from the Department of Agriculture. They will be used as stud bulls for the Sinhala x Jersey cross breeding programme.

### Soil Nutrient Studies :—

1. **Hanwella gravel**—The following experiments commenced during the latter part of last year were completed during the year.

**EXPERIMENT I.** This was a 4<sup>2</sup> factorial pot experiment of 4 levels of P(0, 1½, 3 and 4½ cwt/acre of NaH<sub>2</sub>PO<sub>4</sub>) and 4 levels of N(0, 1½, 3 and 4½ cwt/acre of NH<sub>4</sub>NO<sub>3</sub>) with 2 replicates of all treatments planted to *Paspalum commersonii*. The experiment was harvested on 4 occasions and the data are summarised in Table 1. Significant increase in yields were recorded for both N and P and highest yields were obtained for 3 cwt/acre of NH<sub>4</sub>NO<sub>3</sub> and 4½ cwt/acre of NaH<sub>2</sub>PO<sub>4</sub>.

**TABLE I**

	P <sub>0</sub>	P <sub>1½</sub>	P <sub>3</sub>	P <sub>4½</sub>	Total
N <sub>0</sub>	10.23	11.09	11.69	12.34	45.35
N <sub>1½</sub>	11.60	36.40	36.77	43.35	128.12
N <sub>3</sub>	12.22	47.42	43.00	50.20	152.84
N <sub>4½</sub>	10.70	44.63	49.01	45.43	149.77
Total ...	44.75	139.54	140.47	151.32	

*Total dry matter yield (gm/pot) for the four harvests in Experiment I.*

**EXPERIMENT II.** This was a 4<sup>2</sup> factorial pot experiment of 4 levels of P(0, 1½, 3 and 4½ cwt/acre of NaH<sub>2</sub>PO<sub>4</sub>) and 4 levels of K(0, 1½, 3 and 4½ cwt/acre of K<sub>2</sub>SO<sub>4</sub>) with 2 replicates of all treatments planted to *Paspalum commersonii*. The experiment was harvested on 4 occasions and the data are summarised in Table 2. Significant yield increases were obtained for both P and K.

**TABLE 2**

	$P_0$	$P_{1\frac{1}{2}}$	$P_3$	$P_{4\frac{1}{2}}$	Total
$K_0$	9.43	11.64	13.45	18.94	53.46
$K_{1\frac{1}{2}}$	13.76	41.41	45.44	51.08	151.69
$K_3$	15.05	53.16	59.18	59.03	186.42
$K_{4\frac{1}{2}}$	14.81	52.29	65.88	64.98	197.96
Total	53.05	158.50	183.95	194.03	

Total dry matter yield (gm/pot) for the four harvests in Experiment II.

**EXPERIMENT III.** This was a  $4^2$  factorial pot experiment of 4 levels of Mo (0, 1, 2 and 4 lb/acre of  $(NH_4)_6 Mo_7 O_{24}$ ) and 4 forms of Ca (Canil,  $Ca(OH)_2$ ,  $CaCO_3$  and  $CaSO_4$ ) with 2 replicates of all treatments planted to *Phaseolus lathyroides*. The experiment was harvested on 2 occasions and the data are shown in Table 3. The data indicate that there was no significant response to added Mo. In the case of Ca significant increase in yields were recorded for  $Ca(OH)_2$  and  $CaCO_3$  while a significant decrease in yield was recorded for  $CaSO_4$ .

**TABLE 3**

	$Mo_0$	$Mo_1$	$Mo_2$	$Mo_4$	Total
Canil	8.62	8.12	10.02	9.60	36.36
$Ca(OH)_2$	11.88	13.35	11.79	12.84	49.86
$CaCO_3$	14.71	16.43	13.54	13.01	57.69
$CaSO_4$	4.60	8.67	4.82	9.57	27.66
Total ...	39.81	46.57	40.17	45.02	

Total dry matter yield (gm/pot) from the 2 harvests done in Experiment III.

**EXPERIMENT IV.** This was a  $4^2$  factorial pot experiment of 4 level of Mo (0, 1, 2 and 4 lb/acre of  $(NH_4)_6 Mo_7 O_{24}$ ) and 4 levels of N (0,  $1\frac{1}{2}$ , 3 and  $4\frac{1}{2}$  cwt/acre of  $NH_4 NO_3$ ) with 2 replicates of all treatments planted to *Phaseolus atropurpureous* variety "Siratro". This experiment was harvested once when the entire plant was uprooted with the nodules intact. The roots and the shoots were dried and weighed separately and the nodules in the roots were counted. The data summarised in Table 4 indicate that while there was no significant difference in weights of the roots and shoots for the different treatments there was a significant difference in the number of nodules per plant for both the levels of N and Mo.

TABLE 4

		$Mo_0$	$Mo_1$	$Mo_2$	$Mo_4$	Total
Wt. of shoots per plant	$N_0$	3.10	5.16	4.61	4.02	16.89
	$N_{1\frac{1}{2}}$	4.46	5.17	4.12	4.52	18.27
	$N_3$	4.12	6.32	5.14	4.04	19.62
	$N_{4\frac{1}{2}}$	4.80	4.51	5.35	6.68	21.34
	Total	16.48	21.16	19.22	19.26	
Wt. of roots per plant	$N_0$	1.26	3.61	2.99	2.14	10.00
	$N_{1\frac{1}{2}}$	2.55	2.75	2.03	2.13	9.46
	$N_3$	1.92	2.67	2.26	1.23	8.08
	$N_{4\frac{1}{2}}$	1.55	1.70	2.82	2.07	9.14
	Total	7.28	10.73	10.10	8.57	
No. of nodules per plant	$N_0$	24	45	122	131	322
	$N_{1\frac{1}{2}}$	31	16	18	17	82
	$N_3$	8	5	7	3	23
	$N_{4\frac{1}{2}}$	1	1	19	7	28
	Total ...	64	67	166	158	

Yield per plant (gm) of shoots and roots and the No. of nodules for the different treatments in Experiment IV.

The data from the four experiments carried out with the lateritic gravel at Hanwella indicate that for optimum plant growth an initial application of 3 cwt/acre each of sulphate of potash and saphos phosphate would be necessary. Growth of legumes would be greatly benefitted by the application of alkaline forms of calcium particularly  $CaCO_3$ . For proper nodulation of leguminous plants the incorporation of a small quantity of molybdenum in the fertilizer mixture would also be necessary.

## 2. Attavillu soils—

Attavillu is situated in the Puttalam district about 2 miles South of the town and about 7 miles inland. The vegetation of the area is a low tropical forest. The area has recently been alienated to youth settlement schemes.

Three well defined series of soils can be recognised in the region, namely the Kiulkelle sandy loams, the Kallady clay loams and the Madurankuliya white sands. Soil nutrient studies of these soils were undertaken during the year and the following experiments have been set up.

- (a) **Kiulkelle sandy loams**—These soils are essentially similar to those found at Vanathavillu reported in the Annual reports of 1958 and 1959. Two distinct phases are recognised, a well drained red sandy loam and an imperfectly drained whitish yellow loam. Those two soil types were studied separately to compare their nutrient status.

#### **Kiulkelle red sandy loam.**

**EXPERIMENT I.** This was a  $2^5$  factorial pot experiment of N, P, K, Ca and Mg planted to *Paspalum commersonii* and *Phaseolus lathyroides* with 2 replicates of all treatments for *Paspalum* and 1 replicate for *Phaseolus* respectively. *Paspalum* was harvested on three occasions and *Phaseolus* on 2 occasions. Significant increase in yields were recorded for N, P and K at the 1st harvest stage. From the 2nd harvest onwards P gave a negative response. This release of P with time has been observed with other soils too and has been fully described by Santhirasegaram (1966).

**EXPERIMENT II.** This was a  $4^2$  factorial pot experiment of 4 forms of N(Nnil,  $\text{NH}_4\text{NO}_3$ ,  $(\text{NH}_4)_2\text{SO}_4$  and  $\text{CO}(\text{NH}_2)_2$ ) and 4 forms of Ca(Canil,  $\text{Ca}(\text{OH})_2$ ,  $\text{CaCO}_3$  and  $\text{CaSO}_4$ ) planted to *Paspalum commersonii* with 2 replicates of all treatments. The experiment has been harvested on 2 occasions and the data are being analysed.

**EXPERIMENT III.** This was a  $2^5$  factorial pot experiment of Fe, Cu, Zn, Mn and Mo planted to *Paspalum commersonii* and *Phaseolus lathyroides*. *Paspalum* was harvested on 2 occasions and *Phaseolus* on 3 occasions. The data indicate that none of the tested nutrients are deficient in the soil.

**EXPERIMENT IV.** This was a comparison of the effect of five forms of Sulphur as (Snil, element,  $\text{H}_2\text{SO}_4$ ,  $\text{CaSO}_4$ ,  $\text{MgSO}_4$ ,  $\text{K}_2\text{SO}_4$ ) with the respective chlorides on the growth of *Paspalum commersonii* and *Phaseolus lathyroides*. Both species were harvested on 2 occasions and the data indicate significant yield increases due to all forms of tested sulphur.

**EXPERIMENT V.** This was a  $4^3$  factorial pot experiment of 4 levels of each of N, P and K planted to *Paspalum commersonii* with 2 replicates of all treatments. The experiment was harvested on 2 occasions. All the tested nutrients increased yields significantly. The data are summarised in Table 5.

**TABLE 5**

Treatment		$P_0$	$P_{1\frac{1}{2}}$	$P_3$	$P_{4\frac{1}{2}}$	Total
$N_0$	$K_0$	1.06	2.28	4.84	3.52	11.70
	$K_{1\frac{1}{2}}$	1.45	2.73	5.33	4.68	14.19
	$K_3$	1.31	2.58	3.51	4.04	11.44
	$K_{4\frac{1}{2}}$	1.16	2.63	3.14	4.30	11.23
Total		4.98	10.22	16.82	16.54	
$N_{2\frac{1}{2}}$	$K_0$	1.90	4.54	5.28	5.72	19.44
	$K_{1\frac{1}{2}}$	1.11	5.66	8.56	6.87	22.20
	$K_3$	3.19	6.40	9.72	5.32	24.63
	$K_{4\frac{1}{2}}$	1.71	4.24	8.52	6.59	21.06
Total		7.91	20.84	32.08	24.50	
$N_5$	$K_0$	1.56	7.36	14.50	11.30	34.72
	$K_{1\frac{1}{2}}$	1.12	7.66	13.21	9.62	31.61
	$K_3$	1.34	8.83	7.37	7.85	25.39
	$K_{4\frac{1}{2}}$	1.04	5.96	8.66	12.70	28.34
Total		5.06	29.81	43.74	41.47	
$N_{7\frac{1}{2}}$	$K_0$	1.50	7.08	14.31	11.45	34.34
	$K_{1\frac{1}{2}}$	1.18	8.93	18.07	13.55	41.73
	$K_3$	1.38	7.28	8.33	17.49	34.48
	$K_{4\frac{1}{2}}$	0.78	9.34	10.88	16.19	37.19
Total		4.84	32.63	51.59	58.68	

Total yield (gm/pot) for the 2 harvests in experiment V.

## Kiulkeile yellow loam

**EXPERIMENT I.** This was a  $2^5$  factorial pot experiment of N,P,K, Ca and Mg planted to *Paspalum commersonii* and *Phaseolus lathyroides* with 2 replicates of all treatments for *Paspalum* and 1 replicate for *Phaseolus*. Both species were harvested on 3 occasions. N,P, and K increased yields significantly. Ca and Mg had no effect on the yield of both species. The response to added P decreased with time indicating a release of P on wetting.

**EXPERIMENT II.** This was a  $2^5$  factorial pot experiment of Fe, Cu, Zn, Mn and Mo planted to *Paspalum commersonii*. The experiment was harvested on 4 occasions. None of the tested nutrients were found to be deficient in the soil.

**EXPERIMENT III.** This was a comparison of five forms of Sulphur (as the element,  $K_2SO_4$ ,  $MgSO_4$ ,  $CaSO_4$  and  $H_2SO_4$ ) with their respective chlorides. The experiment was planted to *Paspalum commersonii* and harvested 4 times. None of the tested forms of Sulphur had any effect on the dry matter yield.

**EXPERIMENT IV.** This was a  $4^2$  factorial pot experiment of 4 levels of P(0,  $1\frac{1}{2}$ , 3 and  $4\frac{1}{2}$  cwt/acre of  $NaH_2PO_4$ ) and 4 levels of K(0,  $1\frac{1}{2}$ , 3 and  $4\frac{1}{2}$  cwt/acre of  $K_2SO_4$ ) planted to *Paspalum commersonii* with 2 replicates of all treatments. The experiment was harvested on 3 occasions and the data are summarised in Table 6.

TABLE 6

Treatments	$P_0$	$P_{1\frac{1}{2}}$	$P_3$	$P_{4\frac{1}{2}}$	Total
$K_0$	2.43	10.66	14.46	17.99	45.54
$K_{1\frac{1}{2}}$	2.50	13.96	18.23	16.81	51.50
$K_3$	1.40	12.89	11.29	18.76	44.34
$K_{4\frac{1}{2}}$	5.08	13.29	13.88	18.95	51.20
Total	11.41	50.80	57.86	72.57	

Total dry matter yield (gm/pot) for the 3 harvests in experiment IV.

## Kallady clay loam

This soil was sampled towards the latter part of the year and preliminary experiments have been set up to determine the deficient nutrients.

## 2. INTERCROPPING WITH COCONUTS.

Effect of pasture on nut yields.

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

This experiment was manured and grazed to schedule during the year. The uncorrected nut yield data and the herbage yield for the 5th year are presented in Table 7.

**TABLE 7**

Treatment	No. of Nuts/acre	Herbage yield D.M. gm/M <sup>2</sup>
Weed control FN GO	4419	179.4
B.brizantha FN GO	2880	393.3
" FN GH	3260	291.6
" FH GH	5125	209.8
" FN GN	4163	416.1
" FH GN	4282	483.2
F = Fertilizer, G = Grazing, O = Nil		
N = Normal, H = Heavy.		

*Number of nuts/acre (uncorrected) and dry matter yield of herbage (gm/M<sup>2</sup>) due to levels of manuring and grazing a coconut/B.brizantha pasture association.*

The normal level of fertilizer in this experiment is a mixture of 2 cwts of Sulphate of ammonia, 1 cwt. each of saphos phosphate and muriate of potash applied broadcast per acre per year. The heavy level of fertilizer is double this quantity. The normal level of grazing is 2 adult sinhala cows/acre and the heavy level of grazing is 16 adult sinhala cows/acre.

The data indicate a sharp drop in the yield of nuts due to the establishment of the pasture but appears to be corrected by fertilizer and grazing the pasture.

**The effect of level of fertilizer (N,P, and K) on a coconut cum pasture association (P<sub>21</sub> R/E).**

The data for the 5th year are presented in Table 8. The pasture (B.b.) in this experiment is grazed at an intensity of 2 adult sinhala cows per acre. As reported last year B.brizantha does not appear to respond to higher levels of fertilizer under coconut. At the higher level of N applied there appears to be a depression in the yield of nuts.

**TABLE 8**

Treatment	Herbage yield D.M. G/M <sup>2</sup>	No. of Nuts/acre	Wt. of copra lb/acre
N <sub>2</sub> P <sub>1</sub> K <sub>1</sub>	416.3	4163	1862.3
N <sub>2</sub> P <sub>1</sub> K <sub>2</sub>	402.1	4899	2237.3
N <sub>4</sub> P <sub>1</sub> K <sub>1</sub>	500.7	3904	1636.7
N <sub>4</sub> P <sub>1</sub> K <sub>2</sub>	430.4	4348	1900.3
N <sub>2</sub> P <sub>2</sub> K <sub>1</sub>	409.5	4331	1988.0
N <sub>2</sub> P <sub>2</sub> K <sub>2</sub>	476.1	4821	2223.7
N <sub>4</sub> P <sub>2</sub> K <sub>2</sub>	442.3	3899	1672.0
N <sub>4</sub> P <sub>2</sub> K <sub>2</sub>	483.7	4282	1852.0

*No. of nuts per acre (uncorrected) yield of copra per acre and the yield of pasture (gm/M<sup>2</sup>) of a coconut and B.brizantha pasture association due to level of fertilizer.*

**Levels of fertilizer x pasture management on the yield of coconut and pasture (P<sub>22</sub> R/E).**

Due to a breakdown in the mowing machinery this experiment could not be mown in May/June season. As such the pasture was not sampled in May/June. The herbage yield data for the sampling done in Oct/November and the nut yield data for the 4th year are presented in Table 9. The yield of pasture is increased at the higher levels of fertilizer for both systems of management. However the yield of the pasture appears to be greatly depressed by the mowing compared to grazing. Nut yields do not appear to be influenced by the management of the pasture.

**TABLE 9**

Treatment	Herbage yield GM/M <sup>2</sup>	No. of Nuts/acre	Wt. of copra lb/acre
$\frac{1}{2}$ Fertilizer pasture mown	99.4	4429	1826
1 — do —	111.7	4496	1840
2 — do —	177.7	4654	1747
4 — do —	163.5	4732	2025
$\frac{1}{2}$ Fertilizer pasture grazed	120.1	4131	1711
1 — do —	138.9	4785	1868
2 — do —	145.7	4824	2007
4 — do —	220.8	4353	1790

Herbage yield, the yield of nuts per acre and the yield of copra due to levels of fertilizer application and different management of a *B.miliformis* coconut association.

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

This experiment was commenced during the year to study the effect of frequency and intensity of grazing a pasture of *B.brizantha* on the yield and persistency of the pasture and the effect of this management on the nut yields. The frequencies of grazing are at 2, 4 and 6 weeks intervals and intensities are 2 and 4 sinhala cows to the acre. There is also a no grazing control. 2 grazing cycles were completed during the year. The data are shown in Table 10.

**TABLE 10**

Treatment	Herbage yield GM/M <sup>2</sup>	No. of nuts/acre
Grazing once in 2 weeks } High	742.7	3065
" " " 4 weeks } intensity	520.2	2541
" " " 6 weeks	578.5	3122
Grazing once in 2 weeks } low	514.7	2943
" " " 4 weeks } intensity	368.7	3158
" " " 6 weeks	359.2	2452
No grazing Control	414.9	2224

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

### Rates of nitrogen application to a coconut cum pasture association (P<sub>12</sub> B/E)

This experiment was manured and the pasture managed to schedule in its 5th year in 1968. The uncorrected nut yield data and the herbage yields are presented in Table II. The pastures that are compared in this experiment are *Brachiaria miliiformis*, *B.brizantha* and *Panicum maximum* with weeds as control. The levels of nitrogen are 1, 2 and 4 cwt/acre of Sulphate of Ammonia per year applied broadcast in 2 equal split doses with the commencement of each monsoon. The data indicate that there is progressive increase in the dry matter yield of herbage and nut yields with increase in the level of nitrogen, except in the herbage dry matter yield of the weed control treatment.

TABLE II.

Treatment		Herbage yield gm/M <sup>2</sup>	No. of nuts per acre	Copra lb/acre
Control (weeds)	N <sub>1</sub>	454.6	2976	1129.6
	N <sub>2</sub>	255.4	3360	1267.2
	N <sub>4</sub>	317.4	3552	1495.0
B.miliiformis	N <sub>1</sub>	376.0	3309	1280.9
	N <sub>2</sub>	445.3	3653	1443.6
	N <sub>4</sub>	470.2	3258	1109.1
B.brizantha	N <sub>1</sub>	309.5	4005	1517.1
	N <sub>2</sub>	342.1	3370	1461.3
	N <sub>4</sub>	444.8	3630	1437.1
P.maximum	N <sub>1</sub>	533.7	2789	901.6
	N <sub>2</sub>	803.5	2546	973.7
	N <sub>4</sub>	893.7	3332	1194.8

Yield of coconuts (nuts/acre and wt. of copra/acre) and herbage (D.M. gm/M<sup>2</sup>) due to levels of nitrogen applied.

### Fertilizer placement to a coconut cum *B.miliiformis* association (P<sub>38</sub> B/E)

The data for the 3rd year of this experiment are presented in Table 12. Three methods of fertilizer placement at two levels of application to a coconut *B.miliiformis* association are studied on this experiment. Similar trends as reported in last years annual report have been observed this year too.

TABLE 12

Treatment		Herbage yield	No. of nuts per acre	wt. of copra per acre
Fertilizer Normal 7 lbs/palm	Total placed	462.3	3082	1260.2
	$\frac{1}{2}$ placed + $\frac{1}{2}$ broadcast	730.9	3552	1324.2
	Total broadcast	1058.0	2806	1228.8
Fertilizer twice normal 14 lb/palm	Total placed	907.1	2924	1040.9
	$\frac{1}{2}$ placed + $\frac{1}{2}$ broadcast	1044.8	2858	1056.7
	Total broadcast	1157.4	3494	1245.0

Yield of coconuts (nuts/acre and copra lb/acre) and the herbage (D.M. gm/M<sup>2</sup>) due to type and level of manuring a coconut *B.miliiformis* association.

An interesting feature of this experiment was the incidence of weeds in the pasture due to the different fertilizer treatments. There were less weeds at the higher level of fertilizer application. When the total quantity of fertilizer was placed at the base of the palm there was a higher incidence of weeds at both levels of fertilizer application. The data is summarised in Table 13.

TABLE 13

Treatment	Yield of weeds D.M. gm/M <sup>2</sup>	Percentage of weeds in the Pasture
Fertilizer normal 7 lbs/palm.	Total placed	46.2
	$\frac{1}{2}$ placed + $\frac{1}{2}$ broadcast	23.8
	Total broadcast	1.1
Fertilizer twice normal 14 lbs/palm	Total placed	2.0
	$\frac{1}{2}$ placed + $\frac{1}{2}$ broadcast	0.9
	Total broadcast	0.7

*Incidence of weeds in a B. miliiformis pasture due to different fertilizer treatments.*

### Selection, establishment and management of pastures

#### (a) Yield and palatability of 10 pasture grasses (P<sub>62</sub> B/E)

This experiment was sampled and grazed twice during the year. The total, dry matter yield for the two samplings done is presented in Table 14. Grazing was done overnight by using a large number of Sinhala cows and at the end of each grazing the experiment was sampled to get an estimate of the quantity of grass consumed. These figures are shown in Table 14. All the pasture varieties in this experiment were analysed for crude protein at the time of grazing. These figures are also shown in Table 14.

TABLE 14

Grass Variety	D.M. gm/M <sup>2</sup> Before grazing	D.M. gm/M <sup>2</sup> After grazing	Percentage crude protein
B. brizantha (Ceylon)	549.2	398.6	5.64
B. brizantha (Tanganika)	749.1	475.3	7.20
B. brizantha (Kenya)	539.6	325.8	5.61
B. brizantha (F.D.A. 15072)	469.5	290.3	7.83
B. ruzezonis	445.1	288.6	7.50
B. distachya	97.5	30.4	6.77
B. miliiformis	576.3	399.8	5.62
B. mutica	614.6	115.3	4.25
Urocloa spp.	235.8	201.5	7.16
Villu grass	146.4	119.3	7.34

*Herbage yield (D.M) gm/M<sub>2</sub> before and after grazing of 10 varieties of pasture grasses together with their crude protein values at the time of grazing.*

5. Comparison of the response to nitrogen and palatability of 4 varieties of Guinea grass (*P.maximum*) (P<sub>61</sub> B/E).

This experiment was sampled and grazed 4 times during the year. The total dry matter production for the year is given in Table 15 together with the crude protein values of the grass at the time of the final sampling done for the year.

TABLE 15

Treatment		Herbage yield D.M. lb/acre	Percentage crude Protein
Ceylon Commercial	N <sub>0</sub>	5241	5.69
	N <sub>1</sub>	8484	6.38
	N <sub>2</sub>	10257	10.88
	N <sub>4</sub>	10088	11.83
Australian blue	N <sub>0</sub>	6815	4.65
	N <sub>1</sub>	9089	6.16
	N <sub>2</sub>	10572	9.24
	N <sub>4</sub>	9164	14.22
Australan Commercial	N <sub>0</sub>	4521	5.90
	N <sub>1</sub>	11602	6.40
	N <sub>2</sub>	9687	10.00
	N <sub>4</sub>	7924	13.15
Jamaican tall	N <sub>0</sub>	7709	5.14
	N <sub>1</sub>	10965	6.60
	N <sub>2</sub>	11396	8.41
	N <sub>4</sub>	8757	14.82

Total dry matter (lb/acre) of 4 varieties of *P.maximum* for 4 cuts, made during the year under 4 levels of nitrogen together with the crude protein value of the grass at the time of the final grazing for the year.

- (c) During the year a number of varieties of legumes and grasses were introduced for evaluation. Of these the following appear to be promising.

Legumes

1. Teramnus uncinatus
2. Dolichos axillaris
3. Vigna vexillata

Grasses

1. Setaria sphacelata
2. Digitaria dicumbens (Pangola grass)
3. Ixophorus unisetus (Honduras grass)

These will be tested out for suitability for cultivation under coconuts.

- (d) Effect of shade and nitrogen on a mixed sward of *B.miliiformis* and *Centrosema pubescens*.

This experiment was set up to study the effect of 2 levels of light, (full day light and ½ day light) and 4 levels of nitrogen (0,1,2 and 4 cwts/acre of (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub>) on a mixed sward of *B.miliiformis* and *Centrosema pubescens*. The experiment was planted in raised plant beds. A 1:1 grass-legume mixture was obtained by planting rooted cuttings

of grass and pregerminated legume seeds 6" apart in alternate positions in rows 6" apart. Shading was obtained by erecting a roof of semitranslucent fibrillite sheets. The experiment was sampled at one month intervals when an area 2' x 1' was cut above ground level and separated into legumes and grass dried and weighed. The data for the 3 harvests taken are shown in Table 16. There was no significant difference in the yield of both grass and legume due to levels of nitrogen while shading brought about significantly different yields in both the grass and the legume. In the case of the legume shading increased the yields while the yield of the grass was depressed. The grass and the legume were both analysed for crude protein and the figures are shown in Table 17.

**TABLE 16**

Treatment	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>4</sub>	Total
Grass (light)	560.6	612.2	685.4	816.6	2674.8
(shade)	270.7	369.0	383.0	390.5	1413.2
Legume (light)	19.3	47.3	40.8	30.1	137.5
(shade)	78.5	106.5	99.0	134.5	418.5

Total dry matter yield (gm/M<sup>2</sup>) for the 3 harvests from *B.miliiformis* and *Centrosema pubescens* due to the 2 levels of light intensity and 4 levels of nitrogen application.

**TABLE 17**

Treatment	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>4</sub>
Grass (light)	8.4	8.7	9.1	8.1
(shade)	11.7	13.4	12.9	12.8
legume (light)	18.5	18.6	21.4	19.3
(shade)	13.3	14.3	16.6	17.1

Percentage of crude protein in *B.miliiformis* and *Centrosema pubescens* growing in association under 2 light intensities and 4 levels of applied nitrogen.

(e) **Yield and protein content of *B.ruziziensis* due to levels of added nitrogen and cutting frequencies.**

This experiment was planted during the year in pots to study the yield and protein content of *B.ruziziensis* due to levels of added nitrogen and cutting frequencies. The levels of nitrogen tested were 0, 1 and 2 cwt/acre of (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub> and the cutting frequencies were at 2, 4 and 6 weeks intervals. All treatments were replicated 4 times. The data are presented in Table 18. There was a sharp drop in the crude protein content of the grass due to decrease in the frequency of cutting from 2 weeks through 4 weeks to 6 weeks intervals. Yields increased significantly due to higher levels of added nitrogen and less frequent cutting treatments.

**TABLE 18**

Treatment	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	Total
(a) Cutting every 2 weeks	6.10	28.00	23.23	54.33
"    "    4    "	6.75	37.20	53.62	97.57
"    "    6    "	13.45	44.30	51.60	109.35
Total	26.30	106.50	128.45	
(b) Cutting every 2 weeks	10.5	13.7	16.5	
"    "    4    "	7.1	8.5	10.0	
"    "    6    "	5.3	6.5	9.6	

*Dry matter yield gm/pot for the 1st cycle (a) and the percentage of crude protein (b) in B.ruziziensis due to levels of nitrogen and frequencies of cutting.*

**CATTLE : Herd Statistics—**

**Herd strength on 31.12.68**

			B/E	R/E	Total
Bulls	...	...	3	3	6
Cows	...	...	80	22	102
Heifer calves	...	...	93	30	123
Bull calves	...	...	65	6	71
<b>Total</b>	...	...	<b>241</b>	<b>61</b>	<b>302</b>

54 animals comprised of 2 bulls, 18 cows, 31 bull calves and 3 heifer calves were sold during the year. There were 64 and 24 births at B/E and R/E respectively.

**Milk Yield**

A total of 80,465.5 pints of milk were produced at the 2 stations B/E and R/E. 55,353 pints were offered to the Milk Board and of that 2029 pints were rejected. 23,373.5 pints were sold to the Staff and a further 1556.5 pints were converted into ghee. The balance was fed to calves.

**Additions to the Herd**

3 Jersey bull calves were purchased from the Government Cattle Farm at Ambewela. They will be used as stud bulls in the Jersey x Sinhala cross breeding programme.

**Staff**

Mr. W. P. T. Perera, Lab. and Field Attendant was promoted Lab. and Field Assistant to the Botanist and left the Division in November.

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

## REPORT OF THE CROP PROTECTION OFFICER for the year 1968

In early 1968 a comprehensive research programme was drawn up for the Crop Protection Division and this was subsequently approved by the Coconut Research Board. The research programme covers a period of three to four years. Some of the research projects have already been started and are in progress. Others will be started in 1969—it is necessary to phase out some of the projects, and certain projects to be started will depend on the results of those in progress.

### I. The Coconut Caterpillar, *Nephantis serinopa* Meyr.

The breeding and release of the parasites of the Coconut Caterpillar, *Nephantis serinopa* Meyr., were continued at the Parasite Breeding Stations at Lunuwila and Mylambavelly. Over four million parasites were produced and over two million released in the affected estates. The numbers produced and released are shown in Table I.

Although large numbers of *Microbracon brevicornis* W. (Braconidae) have been released it does not appear to have established itself in Ceylon as yet.

Census data on the pest-parasite complex were collected from four estates in the N. Western Province, one estate in the Western Province and five estates in the Eastern Province. Each estate was sampled about once every four weeks. Five palms were selected at random and a leaf removed from each of the palms. The leaflets of these five leaves were bulked and a sample of 100 leaflets removed at random for the Coconut Caterpillar population counts. Thus the population density of the pest could be obtained per 100 leaflets. The population counts also give an estimate of the mortality caused by the different parasites. It was found that it would be better to express the population densities of the pest per square metre of leaf area. Some work was, therefore, begun on sampling techniques. When these techniques are perfected it should be possible to give estimates of the population densities of the Coconut Caterpillar per square metre of leaf area, the extent of defoliation and the effect of defoliation on yield.

The census information available since 1964 were analysed. The fluctuations in the Coconut Caterpillar population densities have been published elsewhere. It was found that in one estate in the Eastern Province the population densities decreased while in the other four estates, the population densities tended to increase over the same period. The population densities of the Coconut Caterpillar in the estates sampled in the Western Province have decreased during this period.

The data was also analysed to find out the efficiency of the parasites. It appears that the two indigenous larval parasites, *Spoggosia (Stomatomyia) bezziana* Bar (Tachinidae) and *Nythobia* sp. (Ichneumonidae) cause the biggest percentage parasitism. On the basis of these results, the parasite breeding programme was modified in order to breed large numbers of these two species. The difficulties in breeding *Nythobia* sp. have been overcome and it is now possible to breed this in the laboratory in fairly large numbers.

It has been observed that the pest is prevalent during the dry months of the year and that their numbers decline during the rainy season. The information collected from the estate in the Western Province was examined to determine whether the population fluctuations were related to changes in temperature and rainfall. It was found that warm nights were conducive to higher pest incidence, and that the rainfall of the previous month affects the pest populations adversely. These relationships are only tentative and need to be verified further.

The need for long term population studies of pests is not in doubt. With regard to the pests of coconut, there is paucity of information on the fluctuations of their population densities. As it is extremely essential to have information on the population fluctuations of pests over a long period, the work on the Coconut Caterpillar is being intensified.

### Production and release of parasites of the Coconut Caterpillar

Name of Parasite	Total output at Mylambavelly & Lunuwila	No. of parasites released into different Provinces				Total parasites released
		E.P.	S.P.	N.W.P.	W.P.	
<i>Microbracon brevicornis</i> W.	984,200	306,100	26,200	96,400	56,600	1,469,500
<i>Perisierola nephantidis</i> M	813,300	226,500	14,400	98,200	60,000	1,212,400
<i>Stomatomyia bezziana</i> Bar.	40,118	12,443	—	198	139	52,898
<i>Tetrastichus israeli</i> M & K	1,851,900	653,600	46,250	432,100	251,600	3,235,450
<i>Trichospilus pupivora</i> F	244,700	4,600	9,150	89,000	17,700	365,150
<i>Nythobia (Diocetes)</i> sp.	10,367	—	—	3,640	1,147	15,154
Total	3,944,585	1,203,243	96,000	719,538	387,186	6,350,552

TABLE I

#### 2. The Red Weevil, *Rhyncophorus ferrugineus* F.

The Red Weevil causes considerable damage to coconut in most parts of the Island. The adoption of proper preventive measures is the most effective method of controlling the pest. It is found that in estates where the preventive measures recommended have been implemented, pest incidence remains low.

The injection of insecticides into affected palms can be effective only if the pest is detected early. Because of the difficulty of early detection, other methods of control were investigated.

A study of the insect co-inhabitants of the Red Weevil in Ceylon was carried out to determine whether an effective predator or parasite is available. It is still too early to comment on these studies. Various organisations abroad were contacted to obtain parasites & predators of the Red Weevil. An earwig predator of the Red Weevil eggs and early instar larvae was imported from India.

Studies on the life history and habits of the Red Weevil are in progress. The purpose of these studies is to find out whether the Red Weevil is amenable to control by the sterile-male technique. It is hoped to carry out irradiation studies during the first half of 1969.

### 3. The Rhinoceros Beetle, *Oryctes rhinoceros* L.

The cyclone of September 1967 uprooted a large number of palms in the Chilaw district; many of these uprooted palms still remain on coconut estates and have formed breeding grounds for the Rhinoceros Beetle. Consequently the incidence of the Rhinoceros Beetle, has increased considerably, in the Chilaw district. It is likely that damage due to the Rhinoceros Beetle will continue to increase unless measures are taken to destroy the decaying logs.

Studies on the insect co-inhabitants of the Rhinoceros Beetle were begun in order to determine the parasite-predator complex of the pest in the selected areas. Together with this, a long term study on the population fluctuations of the pest was also in progress.

*Metarrhizium anisopliae* causing a fungal disease of larvae of *O. rhinoceros* was found to occur extensively in the Wennappuwa area.

*Platyperus laevicollis* a predator of the Rhinoceros Beetle was imported from Western Samoa and was reared in the laboratory. It is hoped to release this predator in selected areas in the future. We are most thankful to Mr. A. Catley of the U.N. South Pacific Commission for sending us regular consignments of the predator.

### 4. The Coconut Scale, *Aspidiotus destructor* Sign.

The maximum acreage affected by the Coconut Scale so far has been about 250 acres. It appears that in certain areas it is kept in check by the Lady Bird Beetle *Chilochorus nigrilis*. A long term population study has been started to determine the role played by *Chilochorus nigrilis* in controlling the pest. Population counts are taken regularly in three estates in the Chilaw district.

Spraying against the Coconut Scale has been handed over to the Advisory Division.

### 5. Nettle Grub, *Parasa lepida* Gram. & *Natada nararia*

Small outbreaks of the Nettle Grub, appeared in the Chilaw District. The parasite-predator complex of this pest is being studied in association with Mr. M. B. Wickramasinghe, Asst. Lecturer in Zoology, University of Ceylon, Colombo.

### 6. Crop Losses due to Pest damage.

An attempt was made to determine the reduction in growth and the consequent reduction in yield of coconut due to attack by the Red Weevil, by examining the yield data from experimental plots in which there have been Red Weevil infestations. Data from experimental plots which have been attacked by the Nettle Grub has also been examined with a similar end in view. Based on the results of these, and other considerations, it is hoped to lay out field trials to determine the effect of pest attack, (i.e. Red Weevil infestation, defoliation) on yield. It has been found that it is also necessary to estimate the reduction in yield due to foliar spraying of insecticides as foliar spraying of insecticides appears to influence the activity of insect pollinators of coconut.

### 7. Leaf Scorch Decline of Coconut.

A summary of the investigations carried out so far is published elsewhere (Ceylon Coconut Quarterly Vol. 13 No. 4).

It has been found that there is an increase of *Fusarium* populations in the soil around palms showing signs of advanced Leaf Scorch symptoms as compared with healthy palms and there is a preponderance of *Fusarium* on decayed roots from affected palms,

During the year under review a study was undertaken to determine whether Leaf Scorch was prevalent in any soil type. At our request the Technical Assistant of the Soil Survey Unit carried out a soil survey of the Gonapinuwela area. The lateritic soils of the area (Baddegama series) were further classified according to the depth of the hard pan. The loamy sands along the basins of minor streams (Ginganga series) were classified on the basis of the drainage. The incidence of Leaf Scorch was then estimated on each soil type by making field counts of the healthy and affected palms. This information and the results of the soil survey were used in relating the incidence of the disease to soil conditions. This work is still in progress. However, the preliminary results seem to indicate that the disease is found to a greater extent on the lateritic soil which has a shallow hard pan where root growth is greatly impeded. Leaf Scorch is also prevalent in the poorly drained alluvial soils, where the water table is between 30-40 inches. The incidence of Leaf Scorch is much less in the well drained lateritic soil.

Detailed studies on the root systems of the Leaf Scorch affected palms have also been made. The results of these will be published later.

#### 8. Nut fall

The information available was analysed to find out whether nut fall of coconut was associated with any particular ecological factor.

#### 9. Staff

Dr. R. A. P. Malalasekera, Research Assistant, resigned in February 1968.

Mr. M. S. Velu, F.A. was promoted to Senior Field Assistant in February 1968.

#### 10. Publications

1. Dr. U. B. M. Ekanayake read the following papers at the FAO T.W.P. on Coconut Production, Protection and Processing held in Jogjakarta, Indonesia in September 1968.

(i) "Population fluctuations of the Coconut Caterpillar *Nephantis serinopa*, in Ceylon."

(ii) "Leaf Scorch Decline of coconut in Ceylon."

2. Mr. P. A. C. R. Perera, Senior Technical Assistant—"Pest Control by the biological method." Ceylon Coconut Planters' Review. Vol 5 No. 2.

3. The following leaflets were revised :

Leaflet No. 39 — Black Beetle.

Leaflet No. 48 — Leaf Blight.

#### 11. General

Considerable difficulty was encountered during the year due to delays in obtaining equipment and other material necessary for experimental work. The need for a workshop at the Institute was felt.

U. B. M. EKANAYAKE  
Crop Protection Officer.

## REPORT OF THE BIOMETRICIAN for the year 1968

### 1. Statistical Service :

Routine analyses of the experiments of the Research Divisions were carried out.

Due to the absence on overseas studies of most heads of Research Divisions, no work of any specialised nature was undertaken.

A life-table of the coconut Industry of Ceylon showing estimated age-groupings was prepared using the acreages of coconut shown for the census years. This work was done for the Director.

### 2. Biometrical Studies :

The recordings of the Calibration Trial were carried out as per schedule.

This experiment has been in progress since 1963. Without at least 10 years' records, it is premature to analyse the data.

### 3. Agri-Meteorology :

#### (a) Meteorological Stations :

The meteorological stations at Bandirippuwa Estate, Rathmalagara Estate and the Isolated Seed Garden were maintained satisfactorily.

#### (b) Rainfall 1968 and Crop Prospects 1969 :

**TABLE I**  
Rainfall and its Distribution in Important Coconut Growing Areas of Ceylon

STATION	TOTAL RAINFALL			EFFECTIVE RAINFALL			DISTRIBUTION INDICES		
	1968	1967	Average (53-67)	1968	1967	Average (53-67)	1968	1967	Average (53-67)
LUNUWILA (Bandirippuwa Estate)	69.61	92.39	79.91	69.61	78.79	74.70	(i) 1.8778 (ii) 2.8032	(i) 1.7249 (ii) 2.0030	(i) 1.8938 (ii) 2.7920
MADAMPE (Rathmalagara Estate)	61.83	73.84	64.45	61.83	63.40	61.78	(i) 1.6397 (ii) 2.4775	(i) 1.6190 (ii) 2.0400	(i) 1.6687 (ii) 2.2646
CHILAW	51.38	77.89	63.62	50.25	62.60	59.89	(i) 1.2153 (ii) 1.6664	(i) 1.4856 (ii) 1.7801	(i) 1.5297 (ii) 2.0574
PUTTALAM	41.54	45.68	47.29	41.54	45.68	45.64	(i) 1.0697 (ii) 1.2962	(i) 1.1367 (ii) 1.2778	(i) 1.2586 (ii) 1.5084
KURUNEGALA	87.12	94.83	85.58	82.84	92.98	80.08	(i) 1.9180 (ii) 2.8081	(i) 2.5504 (ii) 3.0205	(i) 2.0071 (ii) 2.8658

The rainfall of 1968 (both total and effective) was much lower than in 1967 and even the last five years' average, except in Madampe and Kurunegala.

Accordingly, Lunuwila, Chilaw and Puttalam areas are likely to register a fall in crop. Madampe and Kurunegala areas may be about average.

**(c) Crop Forecasting Project :**

Agri-meteorological work at the C.R.I. which commenced in 1956, was restricted so far to the maintenance of the three agri-meteorological stations and preliminary studies on rainfall-crop relationship carried out by the Biometrician as and when spare time was available.

This work was given a more serious footing when the Coconut Research Board on the recommendation of the Biometrician approved of a five-year "Crop Forecasting Project".

The preliminary study undertaken under this project was directed towards examining the relationship between rainfall and the crops of Bandirippuwa Estate.

The results of this preliminary study have been very encouraging. Both scientists and planters have been in agreement for a long time that rainfall was the factor influencing the year to year variations of coconut crops. However to date a quantitative demonstration of this relationship has not been possible. This study though not providing all the answers, did help to reveal the statistical snags in problems of this nature.

From this analysis, it has been possible to derive a crop forecasting formula with a relationship between rainfall and crop of  $R = 0.93$ .

The same data are now being examined with a view to generalising the approach, so that rainfall and crop data from other areas in Ceylon can be examined with a view to evolving a crop-forecasting formula for given regions and/or for the whole Island.

**4. Production and Exports :**

**(a) Production :**

The estimated production of coconuts in Ceylon for the year 1968 is 2764 million nuts. This is 7.3% more than the previous year, 0.5% less than last five-years' average and 12.2% less than the peak production registered in 1964.

**(b) Exports :**

The total quantity (nut equivalent) of the major coconut products exported in 1968 is 1103 million nuts. This is 16% over that of the previous year, 9.6 % lower than the last 5-years' average and 32.2% lower than 1964, which registered peak exports.

**5. General :**

The Biometrician attended the third sessions of the F.A.O. Technical Working Party on Coconut Production, Protection and Processing held in Indonesia in September 1968.

A paper entitled "Forecasting coconut crops using rainfall data" was read by the Biometrician at this conference.

The Biometrician assisted the Vidyodaya University of Ceylon and the Rubber Research Institute in their experimental work.

**5. Personnel :**

The Graduate Technical Assistant Mr. V. T. L. Bogahawatte, recruited on 1st June, 1968, resigned from his post on 1st November, 1968.

The Lab. & Field attendant Mr. D. T. Fernandopulle was promoted to the grade of Lab. & Field Assistant as from 1st November, 1968.

V. ABEYWARDENA  
*Biometrician.*

# REPORT OF THE CHIEF ADVISORY OFFICER for the year 1968.

## PART I — ADVISORY

During the period under review 7,699 visits have been made to coconut lands, by the Field Staff to advise owners and those in charge, on the value of manuring, adoption of improved methods of cultivation, management practice and control of pests and diseases in coconut. These visits have been made in connection with work on preplanting, follow-up, general advice, crop improvement and inspections under the fertilizer subsidy scheme. On these visits, the field staff have given demonstrations where necessary, on how various aspects of work should be carried out. They have also distributed advisory leaflets, fertilizer application forms and seedling application forms. Some of these visits have been in regard to certain special problems, pertaining to coconut, that have been referred to this division. The field advisory service which is rendered free of cost has been carried out, on an average by twenty two Advisory Field Officers stationed in different parts of the country. Besides visits, a large number of inquiries have been attended to, by correspondence during this period. The field staff have also attended a number of meetings and delivered talks. The division participated in three agricultural exhibitions held in Mapalana, Kurunegala, and Horana.

In May 1968, the field unit for crop protection work was handed over to this division by the Crop Protection Division. This unit consists of power spraying equipment for use against pests and diseases on palms where the foliage is beyond the reach of hand operated pressure sprayers. The unit is operated by the Institute's officers and spraying, when required is done free of cost, except that the land owner has to provide the necessary chemicals, labour & transport within the land. This free crop protection service has been made available to coconut growers as it is not economical for them to own and maintain power sprayers and other equipment when occasional spraying against pests and diseases becomes necessary. A total of 1,359 coconut palms in four estates situated in Kurunegala and Chilaw Districts have been sprayed since taking over the unit this year against coconut scale infestations.

The various items of work that have been done during visits are summarised below :

### 1. SOIL CONSERVATION :

(a)	No. of holdings where 'On-land' advice has been given	...	2327,
(b)	No. of holdings where 'On-land' demonstrations of tracings has been done	... ..	267
(c)	Extent of tracing done	... ..	7,014 chains

### 2. DRAINING OF WATER LOGGED LANDS :

(a)	No. of holdings where 'On-land' advice has been given	...	444
(b)	No. of holdings where 'On-land' demonstrations of tracing has been given...	... ..	106
(c)	Extent of tracing done	... ..	626 chains.

### 3. REPLANTING :

(a)	No. of holdings where 'On-land' advice has been given	...	1,158
(b)	No. of holdings where demonstrations on lining has been done	...	472
(c)	Extent of lining done	... ..	846 acres

#### 4. NEW PLANTING :

(a)	No. of holdings where 'On-land' advice has been given	...	...	...	...	346
(b)	No. of holdings where demonstrations on lining has been done	...	...	...	...	165
(c)	Extent of lining done	...	...	...	...	300 acres

#### 5. MANURING :

(a)	No. of holdings where 'On-land' recommendations has been made	5,201
-----	---	-------

#### 6. HUSK BURYING :

No. of holdings where 'On-land' recommendations has been made	2,670
---	-------

#### 7. CULTURAL OPERATIONS :

No. of holdings where 'On-land' recommendations has been made	1,626
---	-------

#### 8. CONTROL OF WEEDS :

No. of holdings where 'On-land' recommendations has been made	3,095
---	-------

#### 9. AFTER-CARE OF SEEDLINGS :

No. of holdings where 'On-land' recommendations has been made	1,335
---	-------

#### 10. CATCH CROPPING AND INTER CROPPING :

No. of holdings where 'On-land' recommendations has been made	121
---	-----

#### 11. PESTS AND DISEASES :

No. of holdings where 'On-land' recommendations has been made on :

(a)	Red weevil	...	...	...	619
(b)	Black beetle	...	...	...	504
(c)	Termites	...	...	...	406
(d)	Caterpillar	...	...	...	37
(e)	Scale insect	...	...	...	33
(f)	Grey blight	...	...	...	219
(g)	Stem bleeding	...	...	...	76
(h)	Bud rot	...	...	...	71
(i)	Magnesium deficiency	...	...	...	169
(j)	Other pests and diseases	...	...	...	148

The Advisory Field Officers, who were engaged in the sample survey of coconut holdings in Pitigal Korale South & Pitigal Korale North in the Chilaw District in December, 1967 continued to carry out the enumeration of these holdings in January this year. This survey was conducted by the Biometrician of the Institute. With a view to assisting the cyclone affected coconut land owners, in the Chilaw district, it was decided by the Board of Management, to provide free transport of seedlings to those persons who purchased them to replace those lost as a result of the cyclone. In December, one District Coconut Instructor and three Advisory Field Officers were engaged in the distribution of seedlings. A total of 18,183 seedlings have been distributed in this manner among 151 applicants in the district. The response to the offer of free distribution has not been encouraging though sufficient publicity had been given.

The demonstration coconut plantations of the Institute at Pallai, Mundel, Alampil, and Mylambavelly were continued to be maintained for the benefit of coconut growers. At Pallai demonstration centre consisting of thirty one acres, gradual thinning of some of the old stands in the replanted blocks has been done. Thirty palms underplanted in October, 1960 have come into flower. At Mundel, which is fifteen acres in extent, 97% of the palms in the blocks replanted in 1960 were bearing and in the block replanted in December, 1962, 47% of the palms were in bearing at the end of the year. A portion of the 10½ acre block at Mundel, which had been acquired in 1967 was replanted after removal of senile and unproductive, palms. In the rest of this block seedlings were planted adjacent to weak and senile palms along a new planting line. The purpose of the latter system of planting is to gradually and eventually replace by stages, the old stand, as and when they become uneconomical to maintain. This method has been adopted as an alternative to total replanting, where the old stand is not entirely uneconomical. At Alampil demonstration centre the new plantation covers an area of fifteen acres. In this plantation, some of the seven year old palms were affected by the prolonged drought that prevailed in the area during the year, and also as a result of strong winds that occurred, some of them got tilted. These have been straightened and propped. *Gliricidia* cuttings and Margosa seeds, have since been planted as a wind break. Of the seedlings planted in 1961, 98% were bearing and of those planted in 1962, 34% were in bearing. The mixed cover of *Centrosema pubescens* and *Calopogonium muconoides* established in 1962 to control weeds has been found effective. At Mylambavelly, the seedlings on fifteen, of the twenty five acres that had been planted in the previous year, had to be replaced. Owing to severe drought in the area, the seedlings were mulched with husks and regularly watered. Because of the sparse vegetative cover on the soil, attempts were made in the previous year to establish a leguminous cover as a trial. This met with little success. This year a mixture of seeds of *Centrosema pubescens*, *Calopogonium muconoides* and of a *Canavalia* species has been planted out in strips. *Canavalia* species occur as an indigenous cover in the Northern province.

Routine items of work in the above demonstration centres continued to be done as in the previous years.

Every effort has been made with the available staff and resources, to extend to as many coconut growers as possible, the free advisory service. However, with such facilities remaining at the same level as in previous years, it has been difficult to provide a broader service. The acceptance and adoption of new and improved methods by coconut growers, especially small holders, who own approximately 70% of the plantations is slow, and quick results cannot be expected. This is chiefly because unlike other plantations and short term crops like paddy, the response of the coconut palm to treatment in regard to yield in the initial stages of stepping up, from below average or neglected condition is slow and may take even two or more years. For this reason there exists a reluctance among persons, specially in low income groups to invest money on delayed returns. Furthermore, considering the pattern of ownership distribution and the wide variations in performance of the plantations in the island, it becomes imperative, to have adequate facilities to persuade a larger coconut growing public to adopt improved methods. Moreover, in the interest of the entire country's plantations, wider fertilizer use by small holders could be encouraged if fertilizer is made more easily available and on more acceptable terms. Another matter that deserves attention is replanting. It has been estimated that about seven thousand acres of coconut go out of production annually due to senility. To encourage replanting or replacing of senile and uneconomic palms on correct lines, a cash subsidy scheme as in the case of tea and rubber plantation crops would prove to be of immense benefit to the industry. It is envisaged that such a form of assistance would lead to coconut growers, especially small holders adopting correct planting methods and after-care in replanting senile stands. At present, seedlings which are available at a subsidised price of cts. -/25 each are sometimes underplanted at an inappropriate stage or haphazardly and without proper after-care.

With the object of improving the organisation of the Division, the Commissioner of Coconut Rehabilitation formulated during the latter part of the year a programme of work for the Advi-

sory & Extension Services. This programme incorporated the desirability of working in close co-operation with the Coconut Rehabilitation Department, the Fertilizer Corporation and the Extension Aids Division of the Department of Agriculture has been approved by the Board of Management for implementation. Besides what has been suggested therein, the Board of Management has proposed that an intensive programme of work, in and around the coconut areas of the Institute's Head Quarters should be taken up for development by concentrating the Advisory Field Officers in this area; the rehabilitation of the cyclone damaged areas also to be a part of this programme.

#### STAFF:

The position of the staff at the end of the year was as follows :

Research Assistant	...	...	1
District Coconut Instructors	...	...	3
Advisory Field Officers	...	...	22
Clerk/Typists	...	...	2
Office Attendants	...	...	1

#### APPOINTMENTS :

Mr. H. D. M. S. Samaranyake assumed duties as Research Assistant in April, 68, and Mr. W. B. D. V. Fernando was appointed District Coconut Instructor in May, 68.

#### TRANSFERS :

The following transfers were effected in March, 1968 :—

- Mr. T. D. J. R. D. Peiris, A.F.O., from Kurunegala to Head Office.
- Mr. C. A. Fernando, A.F.O., from Head Office to Kurunegala.
- Mr. M. A. S. Perera, A.F.O., to Giriulla.
- Mr. S. Rajapaksa, A.F.O., to Ambalantota.
- Mr. D. H. S. W. Tilakeratne, A.F.O., to Godakawela.
- Mr. D. P. R. N. Edirisinghe, A.F.O., Wennappuwa as from 1.10.68.

#### RESIGNATIONS :

Mr. Parakrama de Silva, A.F.O., resigned from his post in August, 1968.

## PART II

### SUBSIDY SCHEME FOR PLANTING COCONUTS

#### IN CITRONELLA LANDS.

#### ISSUE OF FREE FERTILIZER :

Issue of free fertilizer was made to applicants who had initially obtained fertilizer during the planting seasons May/June, 1961, October/November 1961, May/June, 1963, October/November, 1963 and October/November, 1960.

The particulars of issues were as follows :

Number of applicants to whom permits were issued. ... ..	3,895
Number of applicants who took delivery of fertilizer ... ..	3,757
Quantity of fertilizer issued — 2335 tons 3 Cwt. 14 Lbs.	

**INSPECTION FOR PAYMENTS OF SUBSIDY :**

Inspections of lands for recommending payment of cash subsidy were carried out as previously.

1. Total Number of lands visited by the Field Staff for test checking	5,619
2. Total number of seedlings declared by the applicants ... ..	650,819
3. Total number of seedlings certified by the Field Staff for the payment of the subsidy after test checking ... ..	453,862
4. Difference between the number of seedlings declared by the applicants and the number certified for payment after test checking ... ..	146,446

**STAFF :**

The position of staff at the end of the year was as follows :

District Coconut Instructor	...	...	...	...	1
Advisory Field Officers	...	...	...	...	2
Clerk/Typists	...	...	...	...	5
Field Attendants	...	...	...	...	15
Office Attendants	...	...	...	...	2

**APPOINTMENTS :**

Miss J. A. S. P. B. Ranasinghe and Miss I. Paranavitana assumed duties as Clerk/Typists (Temporary) in April, 68.

**RESIGNATIONS :**

The following officers resigned from their posts :

- Mrs. P. C. S. Fernando, Clerk/Typist (Tem.) as from May, 68.
- Messrs. J. D. M. Wilfred and M. H. D. S. de Silva, Field Attendants (Temporary) as from February, 68.
- Messrs. K. Austin Silva and I. Joseph Fernando, Field Attendants reverted to their substantive posts in the planting division.

**TRANSFERS :**

Transfers of Field Attendants, as and when necessary to areas within the ranges were made during the year. Mr. M. W. F. W. Fernando, Clerk/Typist (Temporary) was transferred as Clerk/Typist (Permanent) to the Administration Division.

C. A. WICKREMASURIYA  
Chief Advisory Officer.

## REPORT OF THE PLANTING OFFICER for the year 1968

### NURSERIES : Seednuts :

13 nurseries were maintained during the year and 2,176,623 seednuts were planted for issue of seedlings during the two seasons—May/June and October/November, 1968, the distribution of seednuts in the nurseries being as follows :

NURSERY	May/June 1968 season	Oct/November 1968 season	TOTAL
1. Rathmalagara ... ..	103,500	266,524	370,024
2. Hettipola ... ..	36,500	40,550	77,050
3. Eraminigolla ... ..	41,414	55,000	96,414
4. Walpita ... ..	100,000	103,750	203,750
5. Wilpotha ... ..	70,000	286,705	356,705
6. Karawaddana ... ..	100,000	232,485	332,485
7. Koggala ... ..	50,000	50,000	100,000
8. Bandirippuwa ... ..	100,505	—	100,505
9. Handapangala ... ..	—	124,075	124,075
10. Mylambavely ... ..	—	70,000	70,000
11. Kalawewa ... ..	—	122,820	122,820
12. Kilinochchi ... ..	—	100,685	100,685
13. Alampil ... ..	—	122,110	122,110
	<u>601,919</u>	<u>1,574,704</u>	<u>2,176,623</u>

### SEEDLINGS :

Orders were accepted during the year 1st January to 31st December, 1968 for 1,585,188 seedlings for issue during May/June and October/November, 1968 seasons. 66,220 seedlings were issued in 1968 from the balance seedlings of Oct./November, 1967. The distribution by nurseries is as follows :

NURSERY	Balance seed- lings of Oct/ November '67 sold in 1968	May/June 1968	Oct./Nov. 1968	TOTAL
1. Rathmalagara ... ..	16,584	67,262	170,446	254,292
2. Hettipola ... ..	3,015	28,447	42,523	73,985
3. Wilpotha ... ..	20,220	68,157	202,975	291,352
4. Bandirippuwa ... ..	—	29,489	27,296	56,785
5. Karawaddana ... ..	6,219	68,188	165,378	239,785
6. Walpita ... ..	2,755	73,716	73,189	149,660
7. Eraminigolla ... ..	60	21,992	41,900	63,952
8. Koggala ... ..	1,439	37,555	28,845	67,839
9. Kalawewa ... ..	50	2,920	84,930	87,900
10. Alampil ... ..	—	—	87,282	87,282
11. Kilinochchi ... ..	1,685	—	71,315	73,000
12. Handapangala ... ..	6,623	—	86,078	92,701
13. Mylambavely ... ..	7,570	—	39,085	46,655
	<u>66,220</u>	<u>397,726</u>	<u>1,121,242</u>	<u>1,585,188</u>

## SUMMARY :

	Balance seedlings of Oct/Nov. 1967 sold in 1968	May/June 1968	Oct/Nov. 1968	TOTAL
Seedlings booked by :				
Small holders ... ..	62,760	201,754	333,665	598,179
Estate owners ... ..	—	190,972	464,033	655,005
Govt. Departments ... ..	10	5,000	45,954	50,964
Land Commissioner ... ..	3,450	—	252,665	256,115
Cyclone relief scheme ... ..	—	—	24,925	24,925
	<u>66,220</u>	<u>397,726</u>	<u>1,121,242</u>	<u>1,585,188</u>

## Seedling issues from 1st January, 1968 to 31st December, 1968

NURSERIES :	Balance seedlings of Oct/Nov. 1966 season	Balance seedlings of Oct/Nov. 1967 season	Seedlings raised for May/June 1968 season	Seedlings raised for Oct/Nov. 1968 season	Seedlings raised for May/June 1969 season	TOTAL
1. Alampil	—	—	—	83,032	—	83,032
2. Bandirippuwa	—	—	52,874	—	—	52,874
3. Eraminigolla	—	12,485	24,932	30,325	—	67,742
4. Handapangala	—	26,748	—	74,878	—	101,626
5. Hettipola	—	6,500	27,967	29,683	8,265	72,415
6. Kalawewa	10	5,510	—	65,400	—	70,920
7. Karawaddana	—	65,879	72,663	141,703	—	280,245
8. Kilinochchi	—	10,170	—	64,285	—	74,455
9. Koggala	—	152,264	34,935	16,530	—	66,729
10. Mylambavely	—	11,592	—	25,760	—	37,352
11. Rathmalagara	—	48,862	66,427	139,095	—	254,384
12. Walpita	—	25,205	65,951	63,572	—	154,728
13. Wilpotha	—	56,870	53,757	186,870	—	297,497
	<u>10</u>	<u>285,085</u>	<u>399,506</u>	<u>921,133</u>	<u>8,265</u>	<u>1,613,999</u>

No. of seedlings issued during the 1st quarter of 1968	...	...	210,101
No. of seedlings issued during the 2nd quarter of 1968	...	...	223,510
No. of seedlings issued during the 3rd quarter of 1968	...	...	193,352
No. of seedlings issued during the 4th quarter of 1968	...	...	987,036
			<u>1,613,999</u>

**Distribution of Orders by Revenue Districts :**

**MAY/JUNE — 1968**

REVENUE DISTRICT	Seedlings booked by small- holders	Seedlings booked by estate owners	Seedlings booked by Govt. Depts.	Seedlings booked by Govt. Agents	TOTAL
1. Colombo/Negombo ...	33,160	38,655	100	—	71,915
2. Kalutara ...	2,307	1,350	1,350	—	5,007
3. Puttalam/Chilaw ...	75,849	59,017	150	—	135,016
4. Kurunegala ...	47,210	63,265	—	—	110,475
5. Anuradhapura	—	—	—	—	—
6. Polonnaruwa ...	175	—	—	—	175
7. Jaffna ...	—	—	—	—	—
8. Vavuniya ...	—	—	—	—	—
9. Mannar ...	—	—	—	—	—
10. Batticaloa ...	—	—	—	—	—
11. Trincomalee ...	100	—	—	—	100
12. Galle ...	10,436	6,425	55	—	16,916
13. Matara ...	2,027	4,600	—	—	6,627
14. Hambantota ...	5,075	900	—	—	5,975
15. Kandy ...	6,387	4,900	—	—	11,287
16. Nuwara Eliya ...	205	—	—	—	205
17. Matale ...	410	1,000	2,745	—	4,155
18. Badulla ...	—	—	—	—	—
19. Monaragala ...	—	800	—	—	800
20. Kegalle ...	14,412	7,510	100	—	22,022
21. Ratnapura ...	4,001	2,550	500	—	7,051
	<u>201,754</u>	<u>190,972</u>	<u>5,000</u>	<u>—</u>	<u>397,726</u>

**Distribution of Orders by Revenue Districts :**

**OCTOBER/NOVEMBER — 1968**

REVENUE DISTRICT	Seedlings booked by small-holders	Seedlings booked by estate owners	Seedlings booked by Govt. Depts.	Seedlings booked by Govt. Agents	TOTAL
1. Colombo/Negombo ...	29,211	27,585	50	—	56,846
2. Kalutara ...	2,595	1,400	—	—	3,995
3. Puttalam/Chilaw ...	120,434	179,636	—	41,750	341,820
4. Kurunegala ...	48,043	92,837	1,450	24,565	166,895
5. Anuradhapura ...	7,060	4,000	—	50,500	61,560
6. Polonnaruwa ...	7,645	9,800	—	—	17,445
7. Jaffna ...	20,150	15,160	300	5,200	40,810
8. Vavuniya ...	30,380	54,265	1,892	29,150	115,687
9. Mannar ...	2,250	2,500	450	—	5,200
10. Batticaloa ...	4,650	10,750	260	7,000	22,660
11. Amparai ...	1,600	3,200	8,500	7,500	20,800
12. Trincomalee ...	1,925	2,500	1,100	—	5,525
13. Galle ...	4,820	3,300	—	1,000	9,120
14. Matara ...	720	2,500	—	5,500	8,720
15. Hambantota ...	6,935	1,100	650	6,000	14,685
16. Kandy ...	12,695	10,750	—	6,000	29,445
17. Nuwara Eliya ...	—	—	6,960	2,500	9,460
18. Matale ...	9,400	22,825	7,296	1,500	41,021
19. Badulla ...	2,950	6,600	7,237	24,000	40,787
20. Monaragala ...	10,000	4,600	9,609	33,500	57,709
21. Kegalle ...	6,746	1,600	200	3,000	11,546
22. Ratnapura ...	3,456	7,125	—	4,000	14,581
	<u>333,665</u>	<u>464,033</u>	<u>45,954</u>	<u>252,665</u>	<u>1,096,317</u>
Seedlings booked under the Cyclone Relief Scheme ...	—	—	—	—	24,925
Balance seedlings of Oct/November 1967 sold in 1968 ...	62,760	—	10	3,450	66,220
					<u>1,585,188</u>

P. D. L. FERNANDO  
Planting Officer,

## REPORT OF THE PUBLICATIONS OFFICER for the year 1968

### **Ceylon Coconut Quarterly**

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

### **Ceylon Coconut Planters' Review**

Two issues of Ceylon Coconut Planters' Review (Vol. V Nos. 2, 3) were published. Vol. V No. 4 was sent to the press but could not be released before the end of the year.

### **Pol Pawath**

The Sinhala Journal, Pol Pawath Vol. V No. 2 was published during the year.

### **Leaflets**

Following leaflets were revised and reprinted during the year—

**Sinhala :** No. 16 — Soil Conservation in Coconut lands.

No. 17 — Cover crops for coconuts.

No. 39 — The Black Beetle and its control.

No. 42 — Leaf Blight.

**English :** No. 5 — The Utilization of Husks on Coconut Estates.

No. 20 — How to make a Barbecue.

No. 42 — Leaf Blight.

14 Sinhala leaflets, 3 Tamil leaflets and 14 English leaflets were reprinted during the year to maintain the stock position.

### **Radio Talks**

Regular programmes in Sinhala and Tamil were broadcast during the year as usual. There were 18 broadcasts in Sinhala and the bulk of our programmes for the year were devoted to the subjects of intercropping, coconut products and crop protection.

There were 12 talks in Tamil and the subject matter for Tamil Talks generally corresponded to that of the Sinhala talks.

### **The Press**

Editors in charge of regular features on Science and agriculture in popular newspapers were contacted and some of them have agreed to give publicity to the work in progress at the C.R.I.

Few of such articles have already appeared. There has also been a favourable response from the editors of science Newspapers in Sinhala.

### **Library**

During the year under review there was an expansion in the work of the Library. Accessions have increased up to 280 journals received on subscriptions and on exchange, and 232 books. This increase in accessions was mainly due to acquisitions of literature in the fields of Entomology and Pathology.

**Library Bulletin.**—Four issues of this quarterly publication have been issued during the year. "Library Corner"—a new feature in our publication "Ceylon Coconut Planters' Review" designed to keep the readers informed of the latest work done on coconut in other parts of the world was found to be popular among the readers as several inquiries have been received from the readers on topics noted under this feature. Apart from written inquiries received in the Library, there were also visitors who came for reference work in the Library.

**Co-operation**—Several books and Journals have been received from the Libraries of the Universities of Colombo and Peradeniya, the Department of Agriculture and the Department of Fisheries. We thank them for their valuable co-operation.

A. K. GUNAPALA  
*Publications Officer.*

## REPORT OF THE WELFARE OFFICER for the year 1968.

The strength of the Staff was as follows :—

	Senior	Intermediate	Asst	Minor	Total
At the end of 1967	5	7	125	109	246
New appointments in 1968	—	2	4	1	7
Resignations in 1968	—	1	8	2	11
Retirements in 1968	—	—	—	1	1
Promotions in 1968	—	—	4	—	4
Staff position as at 31.12.68	5	8	125	107	245

The cadre of the staff at the end of 1968 was 245 as against 246 in 1967. Seven new appointments were made, while there were 11 resignations and 1 retirement during the year. Of the 7 new appointments 5 employees have been recruited internally. The Non-Staff monthly paid employees can now qualify for recruitment to the Minor Staff on completion of 10 years' service as against 12 years earlier. Thus the percentage of internal appointments to and from the Minor Staff to the Assistant Staff has been high and encouraging.

The permanent labour force of the Institute as at 31.12.68 was as follows :—

On monthly pay	...	...	36
On daily pay	...	...	270

This excludes temporary gangs on daily pay and on contract basis employed for 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.

**Workmen's Compensation** :—There were 21 accidents during the year as against 26 in 1967. There were no fatal accidents. As a special privilege the workers are yet covered for the first seven "waiting days" on payment of an additional premium.

**Housing** :—A sum of Rs. 96,255/84 has been spent on the construction of new buildings and Rs. 18,803/50 has been incurred on furniture. One Committee Meeting has been held during the year for the allocation of quarters.

**Financial Aid** :—(a) Festival Advances of Rs. 100/- per head were paid to the Staff and Non-Staff employees drawing a basic salary of Rs. 300/- and less and Rs. 50/- to the daily paid employees. (b) The Provident Fund contributions from the Staff was Rs. 100,993/69 to which the Board contributed an equal amount. The interest accrued was Rs. 78,232/68 as at 31.12.68.

The following payments have been made from the Provident Fund during the year :—

Loans for purchase of building sites and construction of houses ... ..	Rs. 89,490.00
Insurance Premia ... ..	Rs. 24,084.77

(c) The Staff contribution to the Medical Aid Fund during the year was Rs. 23,131.17 while the Board contributed a sum of Rs. 23,131/14 during the same period. 11 Meetings were held during the year, and the following payments have been made :

Payments in respect of claims ... ..	Rs. 36,357.70
Payments in respect of loans ... ..	Rs. 223.65

The panel of doctors has continued to extend credit facilities and special concessions to members.

The minimum rate of contribution of unmarried officers was raised from Rs. 6/- to 10/- and maximum contribution limit was raised from Rs. 150/- to 400/- while the maximum limit of married officers was raised to Rs. 1000/-.

The Committee of Management of the C.R.I. Medical Aid Fund approved a new set of rules for granting of additional assistance.

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

**Thrift, Savings and 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. The Board continued to give an Annual Grant of Rs. 1500/-.

**Recreational and Cultural activities** :—Further improvements were effected to the newly constructed Club House, Tennis Court, Volley-ball Court, Badminton Court and the Practice Cricket Pitch during the year.

Socials and Club Nights were held occasionally and a childrens' party was held for the benefit of labourers' children. A sports meet and a variety entertainment was held and gifts and prizes were distributed to children under 12 years of age. The Club participated in the "D" Division Government Services Cricket Tournament and won up to the Semi-finals. The team also participated in a few friendly Cricket Matches during the year.

Fully furnished Rest Rooms for the Staff and labourers including a radio have been maintained at the Headquarters, and Rest Rooms for labourers in out-station Research Stations have also been provided.

The C.R.I. Art Circle functioned as in the previous years. A number of Catholic employees formed a Catholic Association and participated in a number of pilgrimages.

**Industrial Relations** :—There were no industrial disputes and the atmosphere was quiet during the year. The smooth functioning of the registered Unions brought about better understanding and the employer-employee relationships remained cordial during the year.

F. H. B. FELIX SILVA  
Welfare Officer

## REPORT ON ESTATES

### (i) BANDIRIPPUWA ESTATE

Distribution of Acreage				A.	R.	P.
Agrostologist's Experiments	...	...	...	13	0	02
Botanist's Experiments	...	...	...	57	2	39
Soil Chemist's Experiments	...	...	...	35	0	11
Estate (planted area)	...	...	...	237	1	05
Buildings, Streams & Roads	...	...	...	17	0	00
Waste Land and Paddy	...	...	...	0	3	14
Playground	...	...	...	5	0	00
<b>Total</b>				<b>365</b>	<b>3</b>	<b>31</b>

### Rainfall :—Comparative Rainfall 1967/1968 with respective wet and Rainy Days.

Month	1967			1968			Total Rain fall 1962/66	Average Rain fall 1962/66
	Inches	Wet Days	Rainy Days	Inches	Wet Days	Rainy Days		
January	0.88	3	2	0.23	1	—	14.09	2.82
February	3.47	4	2	2.08	2	—	15.15	2.03
March	1.85	7	—	1.88	7	1	26.90	5.38
April	4.22	6	1	9.14	14	—	32.31	6.46
May	9.49	19	2	2.50	7	1	61.87	12.37
June	6.90	21	2	11.60	20	1	27.78	5.56
July	4.07	10	—	10.01	13	—	18.84	3.76
August	2.99	12	—	0.30	2	1	23.41	4.68
September	11.70	11	1	3.52	13	—	45.74	9.15
October	25.37	17	—	11.49	19	—	74.88	14.98
November	13.88	19	1	12.09	12	1	35.31	7.06
December	4.64	7	1	1.44	4	—	19.98	3.99
<b>Total</b>	<b>88.86</b>	<b>136</b>	<b>12</b>	<b>66.68</b>	<b>114</b>	<b>5</b>	<b>396.26</b>	<b>79.24</b>

**Crops :—Crops From 1964 to 1968 with the respective averages.**

	1965	1964	1966	1967	1968	Average
1st Crop ...	155,216	142,741	89,966	120,536	170,066	135,705
2nd - Crop ...	210,927	218,317	134,782	215,545	172,374	190,389
3rd Crop ...	274,377	268,827	247,774	235,398	243,038	253,882
4th Crop ...	239,159	254,697	239,604	161,285	215,977	222,144
5th Crop ...	167,098	182,795	132,914	178,888	102,517	152,842
6th Crop ...	130,820	120,655	92,468	191,825	769,20	122,537
Total ...	1,177,597	1,188,032	937,508	1,103,478	980,892	1,077,501

**Disposal of Crops (6 crops 1968)**

	Nuts					
Sold on Contract ...	...	...	...	...	337,681	
Sold to Research ...	...	...	...	...	42,358	
Sold to staff ...	...	...	...	...	810	
Nursery ...	...	...	...	...	4,180	
Converted into Copra	...	...	...	...	546,399	
Nut Allowance to staff	...	...	...	...	25,787	
Empties ...	...	...	...	...	22,949	2.34%
Total	...	...	...	...	<u>980,164</u>	

546,399 nuts were turned into copra weighing 379 candies—361 lbs. with an out turn of 1439 nuts per candy; The percentage of nuts per candy was higher due to the fact that nuts converted into copra were those left over from the nuts sold to the Contractors and to the Planning Officer—The percentage of No. 1 quality copra was 88.0

**FIELD NOTES :**

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

Weeds have been efficiently controlled on the estate.

All old drains have been maintained in good order.

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

HENRY A. RANASINGHE,  
*Superintendent,*  
Bandirippuwa Estate.

(ii) RATMALAGARA ESTATE, MADAMPE.

Acreage Statement

Area	A	R	P
Research Section	153	2	0
Estate Section	82	2	0
Roads and Buildings	4	0	0
Jungle and waste lands	19	0	0
Nurseries	13	0	0
	<u>272</u>	<u>0</u>	<u>0</u>

Distribution of acreage by Blocks

	A	R	P
Botanist Experiments	38	2	0
Soil Chemist Experiments	63	0	0
Agrostology Experiments	52	0	0
Estate planted area	82	2	0
Roads and buildings	4	0	0
Jungle and waste land	19	0	0
Nurseries	13	0	0
	<u>272</u>	<u>0</u>	<u>0</u>

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	1555	230	755	1361	1171	1575	2532	333	2721	12,233
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	40	—	58	20	8	146	319
	<u>1631</u>	<u>240</u>	<u>824</u>	<u>1523</u>	<u>1171</u>	<u>1679</u>	<u>2794</u>	<u>355</u>	<u>3135</u>	<u>13,352</u>

**Comparative Rainfall 1968/Total last 5 years**

Month	1967 Ins.	1968 Ins.	1968 wet days	Total 1962/66	Average 1962/66
January	.51	.67	3	7.79	1.56
February	.00	.02	1	5.87	1.17
March	2.24	3.02	9	20.90	4.18
April	7.23	13.78	18	21.39	4.28
May	6.03	.43	5	38.39	7.68
June	5.34	10.18	22	14.34	2.87
July	4.13	6.18	13	13.15	2.63
August	4.42	.04	1	5.59	1.12
September	2.11	2.87	13	28.02	5.60
October	24.44	10.30	18	59.06	11.81
November	9.95	9.84	14	46.01	9.20
December	6.96	4.46	12	18.38	3.68
<b>Total</b>	<b>73.36</b>	<b>61.79</b>	<b>129</b>	<b>278.89</b>	<b>55.78</b>

**CROPS :—**

**Total Crops from 1964 to 1968**

	1964	1965	1966	1967	1968
1st	93,857	98,290	65,484	88,477	127,455
2nd	128,764	162,689	122,472	132,262	152,713
3rd	181,855	162,985	161,622	97,159	130,223
4th	137,397	175,467	158,336	88,310	131,400
5th	116,424	132,521	69,589	102,736	94,000
6th	77,865	62,039	59,963	117,873	75,276
	<b>736,162</b>	<b>793,991</b>	<b>637,466</b>	<b>626,817</b>	<b>711,067</b>

## Disposal of Crops (5 crops only) \*

	nuts
Converted into copra	... 159,615
Sold on contract	... 158,181
Sold to Planting Division	... 28,935
Allowance Staff/labour	... 9,837
Rejections	... 7,238

\*Due to the non availability of Pickers the picking at Ratmalagara Estate has been delayed considerably, the 6th Crop being picked only in February 1969. Every effort is being made to complete the six picks within the year.

**Copra** :—From 159,615 nuts cured, 109 Cdys; 514 lbs; of copra were obtained from all three grades. The percentages being No. 1—73.33%; No. 2—23.25%; No. 3—3.42% with an average out turn of 1,451 nuts per candy. The nuts per candy was high due to the fact that nuts cured into copra were those left behind after delivery to contractors and the Planting Division.

**Field Work** :—All palms in the Estate section were manured during the year with equal proportions of Sulphate of Ammonia; Saphos Phosphate and Muriate of Potash while the palms in the Research Divisions were manured as per Experimental requirements. The fence all round the Research Station was repaired and well maintained. The boundary on the Western side was reinforced with 300 concrete posts.

**Other Field Work** were :—

- Weeding 339 acres
- Clearing & Deepening drains 7,153 faths.
- Husk pits closed 535
- Road repairs 422 faths.
- Boundary fence 1,712 faths.
- Disc harrowing 91 acres.
- Mulching 6,033 palms.
- Levelling 12 anthills.

**Buildings** :—All buildings within the Research Station have been well maintained.

S. T. BRAINE,  
Superintendent,  
Rathmalagara Estate, Madampe.