

CEYLON COCONUT QUARTERLY

Volume XXVI

January - June 1975

Nos. 1/2

ANNUAL REPORT FOR 1974

CONTENTS

| | Page |
|--|------|
| REPORT OF THE COCONUT RESEARCH BOARD (1974) | 1 |
| REPORT OF THE SOIL CHEMISTRY DIVISION (1974) | 13 |
| REPORT OF THE DIVISION OF BOTANY AND PLANT BREEDING (1974) | 22 |
| REPORT OF THE CHEMISTRY DIVISION (1974) | 27 |
| REPORT OF THE AGROSTOLOGY DIVISION (1974) | 43 |
| REPORT OF THE CROP PROTECTION DIVISION (1974) | 51 |
| REPORT OF THE BIOMETRY UNIT (1974) | 57 |
| REPORT OF THE PLANTING DIVISION (1974) | 62 |
| REPORT OF THE PUBLICATIONS/PUBLICITY UNIT AND LIBRARY (1974) | 64 |
| REPORT OF THE ADMINISTRATION DIVISION (1974) | 65 |
| REPORT ON ESTATES (1974) | |
| (i) Bandirippuwa Estate | 68 |
| (ii) Ratmalagara Estate | 71 |
| STAFF LIST | |

Price:

Local : Rs. 2.50

Overseas: £ 0.53

Annual Subscription:

Local : Rs. 4.50

Overseas : £ 1.05

REPORT OF THE COCONUT RESEARCH BOARD (1974)

The present report is the third Annual Report of the Coconut Research Board established under Section 58 (i) of the Coconut Development Act No. 46 of 1971 by an Order published by the Minister of Plantations Industries in the Government Gazette of 30th March 1972.

The powers and functions of this Research Board have been specified in the Said Order establishing the Board.

I BOARD OF DIRECTORS

The following served on the Board of Directors during the year under review:

| | | |
|-------------------------|------------|-----------------------|
| Dr. J. Sivapragasam | (Chairman) | Dr. O. S. Peries |
| Mr. A. J. W. Balthazaar | | * Dr. U. Pethiyagoda |
| Dr. J. W. L. Peiris | | Mr. P. W. R. de Silva |
| Mr. A. Edmund Perera | | |

*(Resigned from the Board with effect from December 1974)

11 Meetings of the Board of Directors were held during the year as follows :-

| No. | Date | | Venue |
|-----|----------|-------------|------------------------------------|
| 21 | 74.01.15 | (9.00 a.m.) | CRI, Bandirippuwa Estate, Lunuwila |
| 22 | 74.02.22 | (9.00 a.m.) | " " " |
| 23 | 74.03.29 | (9.00 a.m.) | " " " |
| 24 | 74.05.03 | (9.00 a.m.) | " " " |
| 25 | 74.05.31 | (9.00 a.m.) | " " " |
| 26 | 74.07.08 | (8.30 a.m.) | " " " |
| 27 | 74.08.09 | (9.00 a.m.) | " " " |
| 28 | 74.09.10 | (2.00 p.m.) | " " " |
| 29 | 74.10.25 | (2.00 p.m.) | " " " |
| 30 | 74.12.02 | (2.00 p.m.) | " " " |
| 31 | 74.12.27 | (9.00 a.m.) | C.D.A., Y.M.B.A. Bldg., Colombo. |

II. STAFF

The staff of the Coconut Research Institute as at 30th June 1974 was as follows:

Chairman: J. Sivapragasam, M.B.B.S. (Cey.).

Director: W. R. N. Nathanael, B.Sc., Ph.D. (Lond.), F.R.I.C., F.I.Chem. (Cey.)

Deputy Director (Administration and Finance) and Secretary to the Board: Mr. K. D. J. Wilmot

Soil Chemistry Division

Soil Chemist

Research Officer

— P. Loganathan, M.Sc. (Hawaii), Ph.D. (Calif.)

— Mr. T. S. Balakrishnamurti, B.Sc. (Lond.), M.Sc. (Aberdeen).

Research Assistants

— M. A. T. de Silva, B.Sc. (Lond.), M.Sc. (Lond.) M.I.Biol.
A. S. Amarasinghe, B.Sc. Agric. (Ceylon).

Division of Botany & Plant Breeding

Botanist — M. A. P. Manthriratna, B.Sc. (Lond.), Ph.D. (Wales)
 Research Assistants — V. U. de S. Jayasuriya, B.Sc. (Cey.)
 Mrs. S. M. Karunaratne, B.Sc. Hons. (Cey.)

Chemistry Division

Chemist — Vacant
 Officer-in-Charge & Research Assistant — M. Jeganathan, B.Sc. (Lond.), M.Phil. (Lond.)
 Research Assistant — S. Mohanadas, B.Sc. (Hons.) (Cey.)

Agrostology Division

Agrostologist — Vacant
 Officer-in-Charge — V. M. F. Alles, B.Sc. (Allahabad)
 Research Assistants — N. T. M. H. de Silva, B.Sc. Agric. (Cey.) (On overseas study leave).
 M.P.L.D. Martin, B.Sc. Agric. (Cey.) (On overseas study leave).

Crop Protection Division

Crop Protection Officer — Vacant
 Officer-in-Charge and Research Assistant — P. Kanagaratnam, B.Sc. Agric. (Cey.)
 Research Assistants — R. Mahindapala, B.Sc. (Cey.) (On overseas study leave)
 B. H. Rohitha, B.Sc. (Cey.) (On overseas study leave).

Biometry Unit

Biometrician — V. Abeywardena, F.I.S.

Planting Division

Planting Officer — P. D. L. Fernando
 Asst. Planting Officer (Advisory) — H. D. M. S. C. Samaranayake, B.Sc. Agric. (Poona)

Publications/Publicity Unit & Library

Publications/Publicity Officer — M. S. S. Fernandopulle, B.A. Hons. (Lond.), B.Th. (Rome)

Administration Division

Asst. Administrative Officer — C. S. E. Fernando, L. L. B. (Cey.)
 Accountant — G. W. M. Wijetunge

Engineering Unit

Engineering Assistant — A. Senaratne

III. GENERAL

- (1) Mr. R. Mahindapala, Research Assistant, who was away on post-graduate training in U.-K. was awarded the Degree of Master of Science in Plant Pathology by the University of Exeter on 74.10.30. He also won a University Scholarship to proceed with his studies at the Ph.D. level at the same University.
- (2) Mr. N. T. M. H. de Silva, Research Assistant, left the Island on 74.01.07 on a Colombo Plan Scholarship to follow a Course in Agricultural Development Economics leading to the Master's degree at the Australian National University.
- (3) Mr. B. H. Rohitha, Research Assistant, left the Island on 74.02.15 on a Commonwealth Scholarship to follow a Course in Agricultural Entomology leading to the Master's Degree at the University of New Zealand.

- (4) Mr. M. S. S. Fernandopulle, Publications/Publicity Officer, left the Island on 74-09-11 on a Commonwealth Scholarship to follow a Course in Agricultural Communication and Journalism at the Indian Institute of Mass Communication, New Delhi. Mr. M. J. C. Perera, Librarian was appointed Officer-in-Charge of the Publications/Publicity Unit from that date.
- (5) Mr. D. E. F. Fernandez, Senior Technical Assistant, who was away on post-graduate training in U.K. was awarded the Degree of Master of Science in Plant Biology by the University of Wales on 74.11.15. He was appointed officer-in-Charge of the Division of Agrostology with effect from 16th December 1974.
- (6) Mr. C. S. E. Fernando, Asst. Administrative Officer, resigned from the service of the Board with effect from 74-09-01 to take up an appointment at the State Distilleries Corporation.
- (7) Miss S. P. Abeysekera was appointed Assistant Administrative Officer with effect from 74.10.10.
- (8) Mr. V. M. F. Alles was appointed Officer-in-Charge of the new Division of Inter-cropping with effect from 16th December, 1974.
- (9) Throughout the year under review Dr. P. R. Dharmadhikari, FAO Entomologist continued to be in charge of the FAO/UNDP Biological Control Project (No. CEY/72/038) which commenced on 72.10.29.
- (10) Mrs. S. M. Karunaratne was appointed Research Assistant to the Botanist with effect from 10th June, 1974.

IV. VISITORS:

The visitors to the Institute during the year included the following.

Dr. K. K. Iya, F. A. O. Regional Office, Bangkok.

Dr. S. Krishnaswami, FAO Chief Advisor, Sericulture Project, Sri Lanka.

Dr. Colvin R. de Silva, Minister of Plantation Industries.

Dr. R. N. González, Jamaica.

Mt. T. de Robest, President, Republic of Nauru.

Mr. W. B. Hilston, Malaysia.

Mr. P. G. Coleman, FAO, Rome.

Mt. Alfonso R. Mendoza, Philippine Coconut Authority, Republic of the Philippines.

Mt. C. W. Brookson, FAO/IBRD, Rome.

Ms. K. R. Ellinger, FAO/IBRD, Rome.

Professor G. Franke, German Democratic Republic.

Mr. K. C. Wilson, University of Papua, New Guinea.

V. PUBLICATIONS

Articles entitled "Coconut Industry (1973)" and "Activities of the Coconut Research Institute in 1973" were contributed to the Report of the Planters' Association of Ceylon.

Two issues of the Ceylon Coconut Quarterly (Volume XXIV Nos. 1/2 and Volume XXIV Nos. 3/4) were published during the year.

One issue of the Sinhala Journal - "Pol Puwath" (Volume V No. 4) was published during the year.

VI. STAFF RESEARCH CONFERENCE

Following the series of Staff Research Conferences started in 1966, one Conference was held during the year as follows:-

Date
74-09-04

Discussion led by
Dr. M. A. P. Manthirratna, Botanist
and Mr. A. S. Amarasinghe,
Research Assistant.

Subject
"The Findings of a Recent
Survey on the Performance
of Coconut Hybrids in
Sri Lanka.

VII. NOTES ON REPORTS OF DIVISIONS

The following notes draw attention to points of interest relating mainly to the work of the Research Divisions of the Institute during the year :-

SOIL CHEMISTRY DIVISION

A. Field Experiments

1. Eleven long term experiments were maintained at Bandirippuwa, Ratmalagara, Pothukulama, Bingiriya, Veyangoda, Dankotuwa and Rathgama. At the end of the year however it was decided to close down the experiments at Monrovia Estate, Rathgama owing to heavy pilferage of experimental nuts and the experiment at Mawatta Estate, Dankotuwa as it was considered that sufficient data had been consolidated to get the information that was sought. The examination of copra samples from this experiment did not reveal symptoms of sulphur deficiency in any of the treatments.

2. Soil Moisture Experiments

Two field experiments, one at Bandirippuwa and the other at Ratmalagara estate were laid down during the year to study the competition for soil moisture between coconut and a pasture underlay of *Brachiaria miliiformis*, using the Neutron Moisture Probe.

B. Pot Experiments

1. A short-term culture experiment to study the effects of iron and manganese at two pH levels on (i) the growth of coconut seedlings and (ii) the uptake and distribution of macro and micronutrients in coconut seedlings was initiated during the year.
2. A second pot experiment to compare the relative efficiencies of local (Eppawala) phosphatic fertilizer and imported saphos phosphate using *Paspalum commersonii* as indicator was carried out during the year. The treatment levels were different from those of the first experiment.

C. Laboratory Investigations

1. In connection with a study on the movement of micronutrients into the developing fruit of the coconut, a series of chemical analyses was carried out on plant samples drawn at different intervals of time (from the fruit at progressive stages of development) from 15 palms selected at Pothukulama Research Station for this experiment.
2. Soil samples from manure circles of super phosphate and saphos phosphate treated plots at various depths were collected to determine the fate of applied phosphorus fertilizer.
3. Studies were carried out to determine the adsorption of phosphorus at different concentrations by Ratmalagara and Bandirippuwa soils. The former showed a higher capacity and energy of adsorption than the soils from Ratmalagara.

4. Chemical analyses of 80 soil samples from the experimental blocks at Marandawila, Monrovia and Naiwala were carried out to determine cation exchange capacity, organic carbon, exchangeable Ca, Mg and K, total nitrogen and acidity.
5. Chemical analyses of 169 soil samples from the Negombo 1" sheet were carried out for the work of the Soil Survey Unit.

D. Soil Surveys

1. Detailed Soil Surveys of the following experimental blocks of the Soil Chemistry Division were carried out -
 - (a) NPK experiment at Naiwala Estate.
 - (b) Form of N, P and Frequency Experiment at Pothukulama.
 - (c) NPK experiment at Pothukulama.
 - (d) NPK Mg experiment at Marandawila estate.
 - (e) NPK Mg experiment at Monrovia Estate.
 - (f) B Zn S experiment at Monrovia Estate.
 - (g) NPK experiment at Bandirippuwa.
2. Detailed reconnaissance Soil survey of Dandegamuwa 1" sheet was commenced.
3. Detailed soil survey of Bandirippuwa Estate was commenced.
4. Miscellaneous soil surveys for private and Government agencies were carried out.

DIVISION OF BOTANY AND PLANT BREEDING

1. *Controlled pollination work*: This was carried out at eight stations, except for a short interruption due to scarcity of essential material. A summary of the pollination work is given below :-

No. of Units: 08

No. of mother palms: 1,080

No. of female flowers pollinated: 197,735 (consisting of 116,523 *typica* x *pumila* and 81,212 *typica* x *typica* (prepotent) crosses.

4,425 *typica* x *typica*, 36,104 *typica* x *pumila* and 10,431 *typica* x Ivory Coast dwarf seednuts resulting from crosses done in 1973 were harvested during the year.

2. *Research Nurseries*: The undermentioned quantities of seed-nuts were planted in the Research Nurseries at Bandirippuwa and the Seed Garden, Ambakelle :-

| <i>Type of material</i> | <i>Nursery location</i> | |
|--------------------------------------|-------------------------|------------------|
| | <i>Bandirippuwa</i> | <i>Ambakelle</i> |
| <i>Typica</i> x <i>typica</i> | 180 | 1,830 |
| <i>Typica</i> x <i>pumila</i> | 33,416 | — |
| <i>Typica</i> x Ivory Coast Dwarf | 12,715 | — |
| * <i>Pumila</i> (open - pollinated) | 2,032 | |
| * <i>Eburnea</i> (open - pollinated) | | 39,492 |

* Planting material for the Seed Garden Expansion Project, Ambakelle and Horrekelly.

This year 24,739 hand pollinated seedlings were issued consisting of 3,604 *typica* x *typica* 14,893 *typica* x *pumila* and 6,242 *pumila* x *typica*. Applications for hand pollinated seedlings were first referred to the Coconut Cultivation Board for inspection of the proposed planting sites and assessment of their suitability, particularly for CRIC 65 hybrids.

3. *Mother Palm Seed Supply*: The Planting Division nurseries were supplied with 1,851,555 selected mother palm seednuts. Re-selection of mother palms was completed at Walahapitiya and Kandawatte estates and 6,469 palms at Walahapitiya and 1,184 palms at Kandawatte have been selected as sources of seednut supply. The produce of a large number of mother palms at Kinyama and St. Anne's Estate, may not be available due to changes of ownership although negotiations regarding this matter are in progress.
4. *Isolated Seed Garden, Ambakelle*: Routine maintenance work was carried out in the 135 acres planted during the period 1955-1966, as well as in the 80 acres cleared and planted in 1972/1973. Yield recordings of individual palms in fields 1 - 8 were continued, and the weighing of husked nuts commenced during the year. Sub-standard palms in fields 6 and 7 were destroyed and 75 acres of jungle were cleared and planted. The planting material consisted of dwarfs (*pumila* and *eburnea*) and talls in the ratio of 25 : 3. In all, about 205 acres have been cleared under the Expansion Project of which 195 acres have been planted. The balance 10 acres consisting of temporary nurseries will be planted during 1975. Emasculation work in fields 5 and 9 commenced in November but had to be temporarily suspended due to heavy infestation with the Nettle grub (*parasa lepida*) and red ants.
5. *Second Seed Garden*: Survey and demarcation of fields for the Second Seed Garden at Horrakelly Estate, Kudawewa was completed late this year, and the replanting programme would probably take place in May/June 1975.
6. *Field Experiments*: The Field experiments and observation trials at Bandirippuwa (14), Ratmalagara (8) Pothukulama (10) and Walpita were continued during the year. Data gathered from Field No. 5 (Pothukulama) have been processed and analysed and a paper is being prepared for publication.
7. *Issues of Variety Seednuts*: 4,391 seednuts have been issued consisting mainly of dwarf red (*regia*), king coconut (*aurantiaca*) and San Ramon seednuts.
8. *Laboratory and Field Investigations*.
 - (a) Study of the pollen characteristics of the progeny from the Diallel Cross experiment (Pothukulama) is yet being continued and it may be possible to conclude this work in 1975.
 - (b) The investigation on the cyto-genetics of *Brachiaria miliiformis*, *B. brizantha* and *B. mutica*, which was suspended following the resignation of the previous Research Assistant, has been resumed by Mr. V. U. de S. Jayasuriya, Research Assistant.
 - (c) *Effect of quality of male parent on the performance of resulting nana x typica F1 hybrids*. Three "types" of *typica* pollen parents are being used for this investigation. (genetic low-yielders (<20 nuts/palm), high - yielders and prepotent palms) and the pollen from these categories is used on the dwarf palms at the Seed Garden, Ambakelle.
 - (d) *Study of light intensity under different planting densities of coconut using a short term crop (Cowpea MI 35) as an indicator plant*. This experiment commenced in late November, and the sampling and analyses will be completed in 1975.
 - (e) Preliminary investigations on tissue culture of coconut (apical buds and flower primordia) in aseptic culture media were carried out under the guidance of Dr. Aries Kovoov (Laboratories de la Differentiation Cellulaire, Paris). It has been observed that explants cultured in a medium containing NAA $\left(\frac{7.8}{10} - \frac{7}{10}\right)$ and NAA + coconut milk) produced more callus than in other media. Furthermore,

explants from young actively growing seedlings seemed able to produce callus whilst the older ones remained dormant in culture. These studies are being continued.

- (f) A field survey of hybrid performance in different agroclimatic zones in Sri Lanka was carried out in association with Mr. A. S. Amarasinghe, R/A, Soil Survey Unit, Division of Soil Chemistry. A report has been submitted to the Coconut Development Authority on this survey.

CHEMISTRY DIVISION

1. Study on Diurnal and Seasonal Fluctuations of Nutrients in Foliar Tissue:

Out of the 1,800 samples collected from this experiment, it was possible to analyse only 1,450 for nitrogen and 500 for P, K, Na, Ca and Mg. The slow progress has been consequent on a defective photo-multiplier tube in the Atomic Absorption Spectrophotometer, which has to be imported. In view of the inordinate delay in getting a spare replacement, the sodium estimations are being abandoned and the EDTA titration method is employed for the estimations of calcium and magnesium.

2. Study on Annual Exhaust of Soil Nutrients:

Studies on the estimation of the annual exhaust of the macro-nutrients (N,P,K, Ca and Mg) from the soil by adult (T x D) hybrids which commenced with the 3rd pick of 1973 were concluded with the second pick of 1974 after consolidating data for six harvests. An assessment was also made of nutrient losses associated with the abscission of fronds. The analytical work pertaining to this study has been completed and the results are being processed for statistical analyses.

3. Toddy Yield from (T X D) Hybrid Palms

Records of toddy yields from 12 healthy hybrid palms from the Botanist's Hybrid Block at Bandirippuwa Estate which commenced in May 1973 were concluded in June 1974. The results of this study have been written up for publication.

4. Effect of Irrigation on the Mineral Nutrient Composition of Foliar Tissue

Samples were drawn at pre-determined intervals for chemical examination from the 14th frond of palms in the Biometrician's Irrigation Experiment at Ratmalagara Estate. The analytical work pertaining to this study has been completed and the results are being processed for statistical analyses.

5. Imparting the Flavour Characteristics of Arrack to Rectified Spirits

Some work has been in progress on the possibilities of preparing an essence from arrack for flavouring rectified spirits. Pursuant to this idea a trial was conducted at the State Distillery, Seeduwa, where rectified spirits blended with coconut toddy in certain proportions were distilled from a pot still. Since the analytical and flavour characteristics of the distillates and the efficiency of distillation were found satisfactory, it is considered that further work will be justified as there is promise of the technique finding useful practical application.

6. Studies on the Maturation of Arrack

In order to follow the changes in the constituents and flavour characteristics of arrack during maturation toddy distillates stored in various types of containers were examined at bi-monthly intervals. This work is to be continued.

7. Preparation of Coconut Jaggery

Based on intensive work carried out during the year, a successful method has been worked out for the preparation of genuine coconut jaggery on a cottage scale. A series of demonstrations have been given at the Institute and a mimeographed leaflet issued for the use of those interested in jaggery making.

The keeping quality of the jaggery has been found satisfactory as long as it is stored in sealed polythene containers.

8. Preservation and Bottling of Fresh Coconut Toddy

Experiments on the preservation and bottling of fresh coconut toddy by heat sterilization alone (without changing its taste or flavour) were successfully carried out during the year. It was found that even after 6 months its keeping qualities were good. Based on this work a paper was submitted by the Research Assistant responsible for the project to Section D of the Ceylon Association for the advancement of Science at its 30th Annual Session.

This work was also extended successfully to the preparation and bottling of a beverage based on the fresh sap for which a patent application has been made.

9. Studies on Techniques of Tapping the Palmyrah Palm

Unlike the coconut palm where continuous tapping for eight months is possible, the current methods of tapping the palmyrah (which is dioecious) are essentially discontinuous. On the basis of the experiments that have been carried out, it would appear that this disability could be surmounted by including off-season flowering and combining a system of rotational tapping of male and female palms, using different tapping techniques as follows:

| <i>Tapping Technique</i> | <i>Palm</i> | <i>Duration</i> |
|----------------------------------|-------------|--------------------|
| "Ari" | Male | January - April |
| "valu" | Male | January - May |
| "Idukku" | Female | February - July |
| "Kai-veddu" | Female | June - November |
| Combined techniques (off-season) | Both | October - December |

As this matter shows promise of countering the problems of seasonal flowering in palmyrah, the work will be continued to see whether it could be adopted for commercial tapping.

AGROSTOLOGY DIVISION

1. Pasture Studies

The following long term experiments established during 1973 were maintained during the year and observations on herbage yields and quality, along with nut yields of the main crop, were recorded :-

P₈₈ at *Bandirippuwa Estate*. To compare the productivity of three fodder species at high levels of nitrogen fertilization under coconut.

P₉₁ at *Ratmalagara Estate*. To investigate the effects of intensity and frequency of defoliation on the productivity of three fodder species under coconut.

P₈₉ and *P₉₀* B/E and *P₉₂* (*Kirimetiya Estate*). These experiments had to be abandoned due to difficulties in conducting them at the above locations. Experiment *P₉₂* to determine the NPK requirements of Pusa Giant Napier under coconut however was re-established at Ratmalagara Estate with the October - December rains.

Owing to a breakdown of the dehydrator, only records of nut yields were maintained in the long term field experiments (P₆, P₂₁, P₂₂ and P₇₀).

2. Experiments on other Intercrops

The following experiments that were laid down in 1973 were successfully concluded during the year. S₂ at Bandirippuwa Estate. An investigation on the effect of nitrogen fertilization and plant density on the growth and yield of manioc under coconut. S₃ at Ratmalagara Estate. To investigate the effects of nitrogen fertilization and planting density on the growth pattern and yield of soyabean (variety - Bragg) under coconut.

S₄ at Ratmalagara Estate. International Soyabean varietal Trial ('INTSOY') - Maha 73/74.

S₅ (B/E) and S₆ (R/E). To determine the optimum spacing for soyabean under coconut. This had to be abandoned because of pest problems and poor establishment.

S₇ (B/E) and S₈ (R/E). International Soyabean varietal Trials - Yala 74. These two trials were established in May and concluded in August/September.

The following experiments which commenced during 1974 are yet in progress :-
S₉ at B/E. To investigate the effect of plant population on the growth and yield of manioc under coconut.

S₁₀ at St. Peter's Estate, Ingiriya. To study the following on Ramie (*Boehmeria nivea*). Its N and K requirement under coconut. The effect of organic manure on its growth (under coconut) and how it affects the yield of the main crop (coconut).

S₁₁ at (R/E). To study the effects of plant density and systems of training on the performance of passion-fruit under coconut and how it affects the yield of the main crop (coconut).
S₁₂ (at B/E) and S₁₃ (at R/E). International soyabean varietal trials - Maha 74/75. These two trials were laid down in October 1974 and are in progress.

3. Intercropping on Estates

With the main object of evaluating the economic feasibility of establishing a range of intercrops in different agroclimatic zones on lands under coconut, a scheme was initiated in April 1974 for carrying out trials on 10 acre blocks at six locations, each in the Wet, Dry and Intermediate Zones. Three projects (out of the 18 proposed) were actually started during the year as follows:-
Wet Zone (2 Projects) at St. Peter's Estate, Ingiriya and at Koodaluagara Estate, Mulleriyawa.
Intermediate Zone (1 Project) at Delgollawatta, Kirimetiya.

Apart from important observational data, on the different categories of crops grown (Pulses, cereals, root crops, fruit crops, vegetables etc.) in the two zones, records were also kept on yield of nuts from the main crop and the income/expenditure in respect of each of the projects.

CROP PROTECTION DIVISION

A. INSECT PESTS

1. *Promecotheca cumingi*. This pest was under perfect control during the year. The mass breeding of its parasites was discontinued due to scarcity of the host material. Regular field observations revealed the very rare occurrence only of pest larvae which in most cases were found to be parasitised.
2. *Coconut Caterpillar (Nephantis serinopa)*. The breeding and release of the parasites of the coconut caterpillar was continued in the insectaries at Lunuwila and Mylambavelly. The infestations in the Southern, Western and North Western Provinces were brought under control, whilst those in the Eastern Province were reduced to sub-economic levels. The incidence of the pest was higher than that during the preceding year.

3. *Coconut Scale (Aspidiotus destructor)*. Emphasis was laid on the biological control of this pest by the mass breeding and release of the two exotic predators – *Cryptognatha nodiceps* and *Lindorus lophantae* in the insectaries at Lunuwila and Colombo. Field observations revealed the presence of indigenous predators of the pest also at work.
4. *Red Weevil (Rhynchophorus ferrugineus)*. No major outbreaks of this pest were recorded. The red – weevil trap was continued to be tested. A laboratory culture of the predator *Platymeris laevicollis* was maintained.
5. *Black Beetle (Oryctes rhinoceros)*. Only a few reports regarding attacks by this pest were received. No research as such was carried out on the black beetle during the year.
6. *Nettle Grub. (Parasa lepida)*. Incidence of this pest was reported from two estates in the Chilaw District. On one estate chemical control was adopted whilst on the other the pest was brought under control by natural enemies.
7. *Yellow Spotted Locust (Aularches miliaris)*. Two reports of its attack were received. Chemical control was recommended.
8. *Mealy Bug (Dysmicoccus sp.)* Several palms at Kakkapalliya were infested with this insect. Observations on the damage caused will be continued in 1975.
9. *Other Pests. (Diocalandra frumenti)*. Attack by this pest was reported from an estate in the Moneragala district. Chemical control was recommended.

No outbreaks of *Psyche albipes*, *Sophrops euristoma* or *Xyleborus similis* were reported during the year under review.

B. DISEASES

1. *Bud Rot disease*. Very few fresh reports were received. Axil placement of fungicidal soap was carried out and found to be effective as a prophylactic measure.
2. *Stem Bleeding*. A few reports were received and necessary recommendations were made for its control.
3. *Grey Blight*. Very few reports were received. In addition to fungicidal spraying, advice was also given for improving the general condition of the palms.
4. *Ganoderma boninense*. Out of 183 palms on an estate at Ambalantota that were attacked by *Ganoderma*, 81 palms died. Research is in progress to get more information on the disease syndrome.
5. *Leaf Scorch Decline*. The field trials to study the effects of improving soil conditions by drainage were continued on two estates at Elpitiya and Gonapinuwala.

Wiltrol C. 120 was injected into 10 palms affected by Leaf Scorch Decline. Observations on its effects are being maintained regularly.

- ## C. BIOLOGICAL CONTROL OF *Eupatorium odoratum*.
- Anmalo insulata* was mass bred and released in several parts of the Island. Regular observations on establishment and field recoveries were made at the release points. Severe defoliation of the bushes has been observed on three estates. At one location the defoliated bushes completely died off towards the end of the year. Large scale breeding of this insect was carried out throughout the year in the insectaries at Lunuwila and Colombo.

Apion brunneonigrum, an exotic beneficial insect which destroys the flowers of *Eupatorium* were imported from Trinidad with the help of the Commonwealth Institute of Biological Control and released at Kallady in the Puttalam District. There are no signs yet of its establishment at the point of release.

BIOMETRY

1. **Statistical Work** Routine statistical work for the Research Divisions (major part for the Soil Chemist, Agrostologist and Botanist) was attended to.

Assistance was given to a number of other Institutions including the Coconut Cultivation Board, Department of Agriculture and the Cotton Research Station, Uda Walawe regarding design of experiments and the analyses of data.

2. **Research**

- i. *Calibration Trial.* This experiment was maintained to schedule.
- ii. *Watering Experiment.* The watering experiment wherein water was supplied at various intensities and frequencies to palms during periods of moisture stress was maintained without interruption.
- iii. *Drought Index.* The analytical work towards improving the 'drought Index' through which crop forecasting is to be done had to be curtailed due to lack of funds for computer payment. A larger vote has however been provided for this work during 1975.

3. **Agri-Meteorology**

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

An enhanced allowance of Rs. 50/- per station for observers was approved by the Board during the year.

4. **General**

The Biometrician continued to function as Consultant Biometrician to the Rubber Research Institute of Ceylon, and also as visiting lecturer in Applied Statistics at the University of Sri Lanka, Vidyodaya Campus. He also gave a course of thirty lectures on Biometry at the Faculty of Agriculture, Peradeniya Campus.

Mr. D. T. Mathes, Graduate Technical Assistant, was released to follow classes at the Vidyodaya Campus leading to a Diploma in Statistics.

PLANTING DIVISION

1. **Seednuts**

The Planting Division maintained 15 nurseries during the year. A total of 1,900,700 seednuts were laid down in the nurseries for seedling issues during May/June and October/December 1974 seasons as follows :

| <i>Season</i> | <i>Seednuts</i> |
|-----------------------|-----------------|
| May/June 1974 | 420,860 |
| October/December 1974 | 1,479,840 |
| | 1,900,700 |
| | 1,900,700 |

2. Seedlings

Orders were booked and payments were received for 1,140,903 seedlings in 1974. 909,200 seedlings were delivered from the nurseries during the year.

PUBLICATIONS/PUBLICITY AND LIBRARY**1. Journals.** The following issues of the C. R. I. journals were published during the year:-**(a) Ceylon Coconut Quarterly**

Volume XXIV, Nos. 1/2

Volume XXIV, Nos. 3/4

(b) Pol Pawath

Volume V, No. 4.

2. Advisory Leaflets. Wherever necessary, C. R. I. Advisory Leaflets were revised and /or reprinted in order to up-date the subject material and to maintain the stock position.**3. Library.** Under the ODA Book Presentation Programme the British Council donated to the Institute 140 books (of our choice) making the library total 3,392. Under this scheme, subscriptions for 30 new journals were also entered, making the total number of journals acquired for the library (on subscriptions and exchange) 380.

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

4. Museum. The building provided for the C. R. I. Museum was partly equipped with furniture and models during the year.

W. R. N. NATHANAEL
Director.

REPORT OF THE SOIL CHEMISTRY DIVISION (1974)

ABSTRACT

Eleven long term field experiments were maintained at Bandirippuwa, Ratmalagara, Pothukulama, Bingiriya, Veyangoda, Dankotuwa and Rathgama. The two experiments at Monrovia Estate, Rathgama and the experiment at Mawatta Estate, Dankotuwa were closed down at the end of the year. Significant responses to phosphorus and potassium were obtained at Bandirippuwa (4 x 4 x 4 NPK) and Monrovia. At Ratmalagara and Marandawila, significant response to only phosphorus was obtained. At Pothukulama (4 x 4 x 4 NPK) significant response to all three nutrients were obtained.

A short term sand culture experiment was commenced to study the effects of iron and manganese at two pH levels on (i) the growth of coconut seedlings and (ii) the uptake and distribution of macro and micronutrients in coconut seedlings. An experiment on the movement of micronutrients into the developing coconut fruit was also initiated during the year.

Investigations on the downward movement and transformation of soil phosphorus on a sandy loam soil at Pallama was carried out. Laboratory study on the adsorption of phosphorus by several coconut soils was also conducted.

Detailed soil surveys of seven experimental sites of the Division were completed during the year. Detailed reconnaissance soil survey of Dandegammuwa 1" sheet and Detailed soil survey of Bandirippuwa Estate were commenced.

A. FIELD EXPERIMENTS

1.4 x 4 x 4 NPK Experiment on Adult Palms – Bandirippuwa Estate (Commenced November 1960).

Owing to unavailability of fertilizer in time, manuring was not done in 1974. The data for the year show that the responses to phosphorus and potassium were significant at P 0.001.

The main effects are shown in Table A 1.

Table A 1. Yield Data for 1974 – Kg Copra Per Hectare – 163 Palms Per Hectare. Copra Yields Adjusted by Covariance Analysis

| Treatment Annual Per Palm | Kg Copra per Hectare | % | Difference Kg Copra per Hectare |
|---|-------------------------|-------|------------------------------------|
| N ₀ (0Kg Ammonium sulphate) | 1060 | 100 | — |
| N ₁ (1.103 " ") | 1047 | 98.8 | - 13 |
| N ₂ (2.206 " ") | 1006 | 94.9 | -54 |
| N ₃ (3.309 " ") | 992 | 93.6 | -68 |
| P ₀ (0.Kg Saphos phosphate) | 845 | 100 | — |
| P ₁ (0.826 " ") | 1060 | 125.4 | 215* |
| P ₂ (1.652 " ") | 1027 | 121.5 | 182* |
| P ₃ (2.478 " ") | 1173 | 138.9 | 328** |
| K ₀ (0.Kg Muriate of Potash-60%K ₂ O) | 696 | 100 | — |
| K ₁ (0.376 " ") | 989 | 142.0 | 293** |
| K ₂ (0.752 " ") | 1199 | 172.2 | 503*** |
| K ₃ (1.128 " ") | 1221 | 175.4 | 525*** |

Significant difference at P 0.05 = 138.6 Kg per Hectare.

** Significant at P 0.01.

*** Significant at P 0.001.

2. 3 x 3 x 3 NPK Experiment on Young Palms – Ratmalagara Estate (Commenced December 1948)

The annual manuring was done in December 1974. Phosphorus continues to give significant response (P. 0.01)

Table A 2. gives the main effects for the year 1974.

Table A 2. Yield Data for 1974 - Kg Copra Per Hectare - 136 Palms Per Hectare.

| Treatment Annual Per Palm | Kg. Copra per Hectare | % | Difference Kg. Copra per Hectare | Outturn nuts per Metric Ton |
|---|--------------------------|-------|--|--------------------------------------|
| N ₀ (0.681 Kg Ammonium sulphate) | 2628 | 100 | — | 4430 |
| N ₁ (1.362 " ") | 2563 | 97.5 | -65 | 4602 |
| N ₂ (2.043 " ") | 2448 | 93.2 | -180 | 4762 |
| P ₀ (0.454 Kg Saphos phosphate) | 2339 | 100 | — | 4425 |
| P ₁ (0.908 " ") | 2679 | 114.5 | 340** | 4596 |
| P ₂ (1.362 " ") | 2620 | 112.0 | 281* | 4744 |
| K ₀ (0.681 Kg Muriate of potash-60%K ₂ O) | 2456 | 100 | — | 4688 |
| K ₁ (1.362 " ") | 2520 | 102.6 | 64 | 4565 |
| K ₂ (2.043 " ") | 2662 | 108.4 | 106 | 4535 |

Significant difference at P 0.05 = 154.3 Kg per Hectare.

* Significant at P 0.05.

** Significant at P 0.01.

3. 4 x 4 x 4 NPK Experiment on Young Palms - Pothukulama Research Station (Commenced December 1960).

The annual manuring was done in January 1975. The yield data for the year 1974 show significant response to all three nutrients (P 0.05).

The main effects are shown in Table A 3.

Table A 3. Yield Data for 1974 - Kg Copra Per Hectare. 178 Palms Per Hectare.

| Treatment Annual Per Palm | Kg. Copra per Hectare | % | Difference kg. Copra Per Hectare | Outturn nuts per Metric Ton |
|---|--------------------------|-----|--|--------------------------------------|
| N ₀ (0kg Ammonium sulphate) | 2458 | 100 | — | 4416 |
| N ₁ (1.103 " ") | 2878 | 117 | 420* | 4397 |
| N ₂ (2.206 " ") | 2666 | 108 | 208 | 4451 |
| N ₃ (3.309 " ") | 2484 | 101 | 26 | 4593 |
| P ₀ (0kg Saphos Phosphate) | 2266 | 100 | — | 4384 |
| P ₁ (0.826 " ") | 2596 | 115 | 330 | 4519 |
| P ₂ (1.652 " ") | 2745 | 121 | 479* | 4451 |
| P ₃ (2.478 " ") | 2878 | 127 | 612* | 4481 |
| K ₀ (0kg Muriate of potash-60% K ₂ O) | 2385 | 100 | — | 4569 |
| K ₁ (0.454 " ") | 2532 | 106 | 147 | 4514 |
| K ₂ (0.908 " ") | 2753 | 115 | 368* | 4437 |
| K ₃ (1.362 " ") | 2815 | 118 | 430* | 4348 |

Significant difference at P 0.05 = 344.9 Kg Per Hectare

* Significant at P 0.05.

4. Experiment on Forms of Nitrogen and Phosphorus and Frequency of Manuring- Pothukulama Research Station, Pallama (Commenced June 1967)

The fertilizer was not available for the May-June application. As a result all plots were manured with full dosage in January 1975.

The yield data for the year 1974 is shown in Table A 4. There were significant responses to nitrogen and NPK interaction. These are shown in Tables A 5 and A 6.

The quantities of nutrients supplied annually to each palm are as follows:

| | |
|---|--|
| N | 0.227 Kg N |
| P | 0.706 Kg P ₂ O ₅ |
| K | 0.227 Kg K ₂ O |

Control plots received only potash.

Table A 4. Yield Data for 1974-Kg Copra Per Hectare - 178 Palms Per Hectare.

| Treatment | Annual Manuring | | | Biannual Manuring | | |
|--------------------------------------|----------------------|-------|---------------------------------|----------------------|-------|---------------------------------|
| | Kg Copra Per Hectare | % | Difference Kg copra Per Hectare | Kg Copra per Hectare | % | Difference Kg Copra Per Hectare |
| Control | 1009 | 100 | — | 1009 | 100 | — |
| Ammonium sulphate + Saphos phosphate | 1570 | 155.6 | 561 | 1602 | 158.9 | 593 |
| Ammonium sulphate + Super phosphate | 2742 | 271.8 | 1733** | 1614 | 160.0 | 605 |
| Urea + Saphos phosphate | 1563 | 154.9 | 554 | 1547 | 153.3 | 538 |
| Urea + Super Phosphate | 1045 | 103.6 | 36 | 1602 | 158.8 | 593 |
| † Sodium nitrate + Saphos phosphate | 1250 | 123.9 | 241 | 1745 | 172.9 | 736* |
| † Sodium nitrate + Super phosphate | 1757 | 174.1 | 748* | 1140 | 113.0 | 131 |

Significant difference at P 0.05 = 734.8 Kg Per Hectare.

* Significant at P 0.05. ** Significant at P 0.01.

† Due to unavailability of sodium nitrate these plots received sulphate of ammonia since 1972.

Table A 5. N Response - Kg Copra Per Hectare

| Treatment | Kg Copra Per Hectare |
|-------------------|----------------------|
| Control | 1009 |
| Ammonium Sulphate | 1882 |
| Sodium nitrate | 1473 |
| Urea | 1439 |

Table A 6. NPF Interaction - Kg Copra Per Hectare

| | Saphos phosphate | | Super phosphate | |
|-------------------|------------------|----------|-----------------|----------|
| | Annual | Biannual | Annual | Biannual |
| Ammonium sulphate | 1571 | 1602 | 2742 | 1614 |
| Sodium nitrate | 1250 | 1745 | 1757 | 1139 |
| Urea | 1563 | 1547 | 1044 | 1602 |

5. Experiment on Forms of Nitrogen and Frequency of Manuring-Mawatte Estate (Commenced December 1964).

The quantities of nutrients supplied annually per palm are:

| | |
|---|--|
| N | 0.311 Kg N |
| P | 0.416 Kg P ₂ O ₅ |
| K | 0.907 Kg K ₂ O |

The control plots received only phosphorus and potash.

Table A 7. *Yield Data for 1974 - Kg Copra Per Hectare. 163 Palms Per Hectare. Copra Yield Adjusted by Covariance Analysis*

| Treatment | Annual Manuring | | Biannual Manuring | |
|---|-----------------------|-------|-----------------------|-------|
| | Kg. Copra Per Hectare | % | Kg. Copra Per Hectare | % |
| Control | 1003 | 100 | 1003 | 100 |
| Ammonium sulphate | 1116 | 111.3 | 1120 | 111.7 |
| Urea | 1060 | 105.7 | 1042 | 103.9 |
| Ammonium nitrate (ammonium sulphate applied from 1972 on-wards) | 1006 | 103.3 | 1131 | 112.8 |
| Sodium nitrate (ammonium sulphate applied from 1971 onwards).. | 1076 | 107.3 | 1098 | 109.5 |

An examination of copra samples for "rubberyness" showed that samples from all treatments were normal indicating no gross deficiency of sulphur.

As the response to N over a greater number of years of the experiment was not significant, it was decided to close down the experiment.

6. 5 x 5 x 5 NPK Experiment on Adult Palms - Naiwala Estate, Veyangoda (Commenced July 1967).

Owing to the unavailability of fertilizer, 1974 manuring was not done. As in most of the previous years, significant response to potassium (at P 0.01) was obtained.

The estimated yield data (from production function) for the year is given in Table A 8.

Table A 8. *Estimated yield Data for 1974 - Kg Copra Per Hectare - 178 Palms Per Hectare*

| Treatment | Kg. Copra Per Hectare | % | Difference Kg. Copra Per Hectare |
|---|-----------------------|-------|----------------------------------|
| <i>Annual Per Palm</i> | | | |
| N ₀ (0 Kg Ammonium sulphate) | 1270 | 100 | — |
| N ₁ (1.103 " ") | 1357 | 106.9 | 6.9 |
| N ₂ (2.206 " ") | 1380 | 108.7 | 8.7 |
| N ₃ (3.309 " ") | 1339 | 105.4 | 5.4 |
| N ₄ (4.412 " ") | 1233 | 97.1 | - 2.9 |
| P ₀ (0 Kg Saphos phosphate) | 1269 | 100 | — |
| P ₁ (0.826 " ") | 1313 | 103.5 | 3.5 |
| P ₂ (1.652 " ") | 1335 | 105.2 | 5.2 |
| P ₃ (2.478 " ") | 1339 | 105.5 | 5.5 |
| P ₄ (3.304 " ") | 1322 | 104.2 | 4.2 |
| K ₀ (0 Kg Muriate of potash—60%K ₂ O) | 774 | 100 | — |
| K ₁ (0.454 " ") | 1089 | 140.7 | 40.7 |
| K ₂ (0.908 " ") | 1360 | 175.7 | 75.7 |
| K ₃ (1.362 " ") | 1587 | 205.0 | 105.0 |
| K ₄ (1.816 " ") | 1769 | 228.6 | 128.6 |

7. 5 x 5 x 5 x 5 NPK Mg Experiment on Adult Palms - Marandawila Estate, Bingiriya (Commenced November 1967)

Owing to unavailability of fertilizer the annual manuring was not done in 1974. The yield data for 1974 shows significant response to phosphorus (P 0.05).

The main effects are shown in Table A 9.

Table A 9. Estimated Yield Data for 1974 — Kg Copra Per Hectare—178 Palms Per Hectare.

| Treatment Annual Per Palm | Kg. Copra Per Hectare | % | Difference % |
|---|--------------------------|-----|-----------------|
| N ₀ (0. Kg Ammonium sulphate) | 2444 | 100 | — |
| N ₁ (1.103 " ") | 2459 | 101 | 1 |
| N ₂ (2.206 " ") | 2438 | 100 | 0 |
| N ₃ (3.309 " ") | 2380 | 97 | -3 |
| N ₄ (4.412 " ") | 2284 | 94 | -6 |
| P ₀ (0 Kg Saphos phosphate) | 2143 | 100 | — |
| P ₁ (0.826 " ") | 2274 | 106 | 6 |
| P ₂ (1.652 " ") | 2403 | 112 | 12 |
| P ₃ (2.478 " ") | 2530 | 118 | 18 |
| P ₄ (3.304 " ") | 2655 | 124 | 24 |
| K ₀ (0 Kg Muriate of Potash-60%K ₂ O) | 2448 | 100 | — |
| K ₁ (0.454 " ") | 2412 | 99 | -1 |
| K ₂ (0.908 " ") | 2389 | 98 | -2 |
| K ₃ (1.362 " ") | 2378 | 97 | -3 |
| K ₄ (1.816 " ") | 2379 | 97 | -3 |
| Mg ₀ (0 Kg Kieserite) | 2274 | 100 | — |
| Mg ₁ (0.681 " ") | 2393 | 105 | 5 |
| Mg ₂ (1.362 " ") | 2457 | 108 | 8 |
| Mg ₃ (2.043 " ") | 2465 | 108 | 8 |
| Mg ₄ (2.724 " ") | 2417 | 106 | 6 |

8. 5 x 5 x 5 x 5 NPK Mg Experiment on Adult Palms-Monrovia Estate, Rathgama (Commenced November 1967).

In spite of our efforts to prevent loss of nuts, thefts continue to occur in the experimental area and therefore we were compelled to terminate the experiment. In addition the experimental area is of undulating topography and soil survey showed that the soils within this area was not uniform.

9. 5 x 5 x 5 BZnS Experiment on Adult Palms - Monrovia Estate, Rathgama (Commenced June 1969).

The annual manuring was done in June 1974. As in the previous years Zn and S fertilizers were not available and its application was missed. The experiment was closed down in December 1974 for the same reasons as in the experiment A 8.

10. Magnesium Fertilizer Experiment on Young Palms - Bandirippuwa Estate, Lunuwila (Commenced October 1972).

The second differential manuring was done in July 1974. 113½ gms of epsom salt per seedling for Mg₁ plots and 227 gms for Mg₂ plots were applied.

The third differential manuring was done in January 1975. In place of epsom salt kieserite was used at the rate of 152 gms for Mg₁ plots and 304 gms for Mg₂ plots. At the same time 681 gms of CRI ordinary Young Palms mixture was applied to all the palms.

The first leaf counting was carried out in January 1974 and the second in August 1974.

11. Fertilizer Experiment on Young Hybrid Palms – Bandirippuwa Estate (Commenced December 1973).

The first half yearly manuring was done in July 1974 and the second in January 1975. Due to drought conditions in January 1975 all the seedlings were watered in February 1975.

The fertilizer mixture was prepared by mixing 113.5 Kg of Ammonium sulphate, 34 Kg of Saphos Phosphate and 56.8 Kg of Muriate of Potash (60% K₂O). The quantity of mixture per seedling at the different levels were as follows.

| Levels | Quantity (gms per seedling per application) |
|--------|---|
| 0 | 0 |
| 1 | 284 |
| 2 | 568 |
| 3 | 851 |

12. Soil Moisture Experiments

Two field experiments, one at Bandirippuwa and the other at Ratmalagara were commenced to study the competition of soil moisture between coconut and pasture (*Bracharia miliiformis*) using Neutron Moisture Probe. Each area was divided into two "pasture" plots and two "no pasture" plots and three aluminium access tubes per plot were buried at various positions in relation to a selected palm. These positions were (a) in the centre of square, (b) midway between two palms within the row, (c) midway between (b) and the base of the palm.

At Bandirippuwa soil moisture readings were taken once a month commencing July 1974. Bulk densities were also measured. Steps were taken to establish pasture in the experimental plots at Ratmalagara.

B. POT EXPERIMENTS - BANDIRIPPUWA ESTATE

1. Sand Culture Experiment

A sand culture experiment on coconut seedlings was commenced on 23rd September, 1974.

The object of this experiment is to study the effect of iron and manganese at two pH levels on (i) the growth of coconut seedlings and (ii) the uptake and distribution of macro and micronutrients.

In this experiment three supply levels of iron (0, 5.0, and 10.0 ppm Fe) and three supply levels of manganese (0, 1.5 and 3.0 ppm Mn) are to be tested at two levels of pH (4.0 and 7.0).

The experimental layout consists of a randomised block design with three replicates for the 18 treatments. The experiment is being conducted in the glass house.

On the 23rd of September 1974, 54 dehusked seedlings of uniform size were planted in plastic pots (38 cm x 36 cm diam.) containing approximately 30 Kg acid - washed silica sand, and watered regularly with demineralised water until the basal treatments (all nutrients except Fe and Mn) commenced on 11th October 1974. The seednuts were separated (amputated) from the plants on 16th December 1974.

The differential Fe, Mn treatments will be applied in January 1975, and the experiment will be concluded in September 1975 after growth measurements are recorded and the plants sampled for chemical analysis.

2. Comparison of Eppawala Phosphate with Saphos Phosphate Fertilizer

The details of this pot experiment were reported in the 1973 Annual Report. The plant uptake and soil availability of phosphorus for the different treatments are shown in Table B 1 and B 2. Both P uptake and P availability are better in the case of saphos phosphate treatment. Statistical analysis of the data is in progress.

Table B 1. *Uptake of Phosphorus - mg P₂O₅ Per 100 gm Dry Matter.*

| Level | 1st Harvest | | 2nd Harvest | |
|-------|---------------------------|-------------------------|---------------------------|-------------------------|
| | <i>Eppawala Phosphate</i> | <i>Saphos phosphate</i> | <i>Eppawala phosphate</i> | <i>Saphos phosphate</i> |
| 0 | 150 | 186 | 228 | 227 |
| 1 | 200 | 181 | 332 | 351 |
| 2 | 193 | 227 | 336 | 430 |
| 3 | 173 | 230 | 335 | 449 |

Table B 2. *Available Phosphorus (Olsen's) -ppm P. Mean of Four Replicates.*

| Level | <i>Eppawala phosphate</i> | <i>Saphos phosphate</i> |
|-------|---------------------------|-------------------------|
| 0 | 11.28 | 11.00 |
| 1 | 14.08 | 17.42 |
| 2 | 15.63 | 20.24 |
| 3 | 16.02 | 21.87 |

C. LABORATORY INVESTIGATIONS

1. Micronutrients in the developing coconut fruit

An experiment was commenced to study (i) the micronutrient status of female flowers at the opening of spathe, and (ii) the distribution and accumulation of micronutrients in fruits at various physiologically identifiable stages of development.

For this experiment 15 inflorescences of similar physiological age were chosen from a block of coconut palms at the Pothukulama Research Station, Pallama. From each of these inflorescences initially a weekly sampling of female flowers was done until fertilization was complete. Thereafter samplings were continued at monthly intervals. By the end of 1974 the fruits had reached the "Kalati" stage of development.

Initially the entire button was prepared for analysis, but subsequently with the development of the cavity and the formation of water and kernel the fruit components were separated prior to analysis.

2. Adsorption of phosphorus by soils

Adsorption of phosphorus at different concentrations by Ratmalagara and Bandirippuwa soils was carried out. The data fitted langmuir isotherm expressions. Bandirippuwa soils showed a higher capacity and energy of adsorption than Ratmalagara soils.

3. Downward movement and transformation of soil phosphorus at Pothukulama Research Station

Soil samples from the manure circles of super phosphate and saphos phosphate treated plots at various depths were collected to determine the fate of applied phosphorus fertilizers. Preliminary work on development of methods for the determination of calcium - P, iron - P, aluminium - P, organic -P, and occluded -P was commenced. Samples were obtained from the "Forms of N and P and Frequency" experiment.

4. Chemical analysis of soil samples from Negombo one inch sheet

The following analysis was carried out for soil survey work: Available P, total N, organic carbon, pH and conductivity.

5. Chemical analysis of soil samples from the Soil Chemistry Division's field experiments

Estimation of total exchangeable bases, cation exchange capacity, organic carbon, exchangeable calcium, exchangeable magnesium, exchangeable potassium, exchange acidity and total nitrogen were carried out on soils from Marandawila, Monrovia, and Naiwala experiments.

6. Micronutrient analysis

Plant material collected from a previous pot culture experiment to study the effect of micronutrient deficiencies on the nutrient status of coconut seedlings are being analysed for Fe, Mn, Cu, Zn and boron. The breakdown of the EEL 240 Atomic Absorption Spectrophotometer was a severe setback to the programme of analytical work. Using tedious colorimetric methods this work is now progressing slowly.

D. SOIL SURVEY

1. Survey on "Performance of hybrid coconut in relation to soil, agroclimatic conditions and management practices in Sri Lanka"

The above survey was carried out in early part of 1974 jointly with the Division of Botany.

During this survey 46 observational plantations distributed in Colombo, Kegalla, Kalutara, Galle, Matara and Puttalam Districts were visited and 9 soil types were identified.

Performance of hybrid was found to vary considerably with soil types, agroclimatic conditions, management practices and levels of management. No single soil property appeared to limit the growth and yield of hybrids directly, but in some instances, soil depth was a limiting factor. Best performance was observed on gravel free, deep, sandy clay loamy soil with a medium water table.

Findings of this survey and their interpretations were presented at a Staff Research Conference held on 4th September, 1974.

2. Detailed soil surveys of Soil Chemistry Division Experimental Blocks

- (i) 4x4x4 NPK Experiment on Young Palms at Pothukulama Research Station, Pallama. Three soil types were identified.
- (ii) Experiment on N and P Forms and Frequency of Application at Pothukulama Research Station, Pallama. Three soil types were identified.
- (iii) 5x5x5 NPK Mg Experiment on Adult Palms at Marandawila Estate, Bingiriya. Two soil types were identified.

- (iv) 5x5x5 NPK Experiment on Adult Palms at Naiwala Estate, Veyangoda. Two soil types were identified.
- (v) 5x5x5x5 NPK Mg Experiment on Adult Palms at Monrovia Estate, Rathgama.
- (vi) 5x5x5 B Zn S Experiment on Adult Palms at Monrovia Estate, Rathgama. Eleven soil types were identified in the land area under (v) and (vi).
- (vii) 4x4x4 NPK Experiment at Bandirippuwa Estate, Lunuwila. Two soil types were identified.

3. The following major Soil Surveys were commenced during the year

- (i) Detailed reconnaissance soil survey of Dandegamuwa 1" sheet.
- (ii) Detailed soil survey of Bandirippuwa Estate, Lunuwila.

E. MISCELLANEOUS

- (i) The following papers were presented at meetings during the year.
 - (a) Loganathan, P., 1974. Meeting the fertilizer shortage in coconut. Paper presented at a Symposium on "The fertilizer shortage - what can be done about it" organised by the Soil Science Society of Ceylon.
 - (b) Loganathan, P and Maier, W. J., 1974. Some surface chemical aspects in turbidity removal by sand filtration. Paper presented at the Annual Sessions of the Ceylon Association for the Advancement of Science.
- (ii) Mr. A. S. Amerasinghe led a Staff Research Conference jointly with the Botanist on "Findings of a Recent Survey on the Performance of Coconut Hybrids in Sri Lanka" on September 4th 1974.

F. PERSONNEL

- 1. The following appointments were made during the year: Mr. M. D. H. M. William, Technical Assistant - 1st January 1974.
Miss G. V. Mallika, Technical Assistant - 1st July 1974.
Miss S. Periathamby, Technical Assistant - 15th August 1974.
Mr. U. S. S. Perera, Field and Laboratory Assistant - 1st July 1974.
Mr. P. J. C. Fernando, Field and Laboratory Attendant - 1st July 1974.
- 2. Mr. M. D. M. William, Technical Assistant, resigned from the Institute on 31st March 1974.
- 3. Mr. K. S. O. Perera, Technical Assistant, left the island on 31st December 1974 for a training in "Soil Survey and Land Classification" at the International Institute for Aerial Survey and Earth Sciences, the Netherlands.

P. LOGANATHAN
Soil Chemist.

REPORT OF THE DIVISION OF BOTANY AND PLANT BREEDING (1974)

1. BREEDING AND SELECTION :

1.1 Controlled pollination work .

This was carried out at Bandirippuwa, Ratmalagara, Walpita, Ambakelle, Kinyama, Andigedera, Achchitotam and Horrekelly. 1080 mother palms are used as female parents for crossing with selected *pumila* and prepotent palms for the production of *typica* x *pumila* and *typica* x *typica* seednuts respectively. 197,735 female flowers have been pollinated, and this consists of 116,523 *typica* x *typica* and 81,212 *typica* x *pumila* crosses. Table 1 gives a summary of the entire pollination programme.

Table 1

| Station | No. of female flowers pollinated | |
|----------------|----------------------------------|-------------------------------|
| | <i>typica</i> x <i>typica</i> | <i>typica</i> x <i>pumila</i> |
| Walpita | 22,955 | 19,937 |
| Kinyama | 18,752 | 13,935 |
| Andigedera | 22,827 | 11,799 |
| Achchitotam | 7,693 | 6,458 |
| Ratmalagara | 3,409 | 4,048 |
| Horrekelly | 27,641 | 21,155 |
| Bandirippuwa | 4,431 | 3,880 |
| ISG, Ambakelle | 8,815 | — |
| Total | 116,523 | 81,212 |

Emasculation work for the mass production of *pumila* x *typica* hybrid seed at the Coconut Seed Garden, Ambakelle, was recommenced in November after a long lay-off to obtain *pumila* (selfed) seednuts for the Seed Garden Expansion Programme. However, the programme had to be suspended again due to a heavy infestation of nettle grub, (*Parasa lepida*). 50,960 hand pollinated seednuts from crosses done in 1973 consisting of 36,104 *typica* x *pumila*, 4,425 *typica* x *typica* (prepotent) and 10,431 *typica* x *Ivory Coast dwarfs*, were harvested. The private sector was supplied with 215 samples of *typica* (prepotent) pollen and 120 samples of dwarf (*pumila*) pollen to help them to implement their own pollination programmes.

1.2. Research nurseries

Seednuts were planted in the research nurseries at Bandirippuwa and the Coconut Seed Garden, Ambakelle and their distribution is given in table 2.

Table 2

| Type of material | Nursery location | |
|---|------------------|-----------|
| | Bandirippuwa | Ambakelle |
| <i>Typica</i> x <i>typica</i> | 180 | 1,830 |
| <i>Typica</i> x <i>pumila</i> | 33,416 | — |
| <i>Typica</i> x <i>lv. Coast dwarfs</i> | 12,715 | — |
| * <i>Pumila</i> (selfed) | | |
| * <i>Eburnea</i> (selfed) | 2,032 | 39,492 |
| (* see section : 2.2) | | |

1.3 Issues of hand pollinated planting material

In view of the observed relationships between agro-climatic conditions and performance of CRIC 65 *typica x pumila* or *pumila x typica* hybrid (see section 1.4), applications for hybrid seedlings were referred to the Coconut Cultivation Board for a careful assessment of the proposed planting sites as to their suitability for hybrids in order to ensure that the best use is made of the available material. About 25,000 hand pollinated seedlings were issued consisting of 3604 *typica x typica* 14,893 *typica x pumila* and 6242 *pumila x typica* seedlings.

1.4 Field survey of hybrid performance

CRIC 65 hybrids have been issued in limited quantities during the past fifteen years. The performance of these hybrids in relation to soil type, agro-climate and management was assessed in conjunction with the Soil Survey Unit of the Division of Soil Chemistry. The Survey was carried out during January/February, at the height of the drought, to observe hybrid performance in relation to water stress in the different soil types. The plantations and small-holdings inspected were categorized in the following manner :-

- (a) Hybrid plantations maintained by the Coconut Research Board at its stations at Bandirippuwa, Ratmalagara and Poththukulama.
- (b) 5 acre "Observation blocks" planted in the different coconut growing areas since 1970.
- (c) Hybrids issued to small-holders by the Coconut Research Institute since 1964.
- (d) Estates where fields have been replanted with hybrids produced by them or bought from private sources working their own pollination units with technical assistance from the Institute.

In all, 43 sites were visited in the Colombo, Kegalle, Kurunegala, Puttalam, Chilaw, Kalutara, Galle and Matara Districts, and the following observations were made :-

1.4.1 Growth, flowering and yield of the hybrids were satisfactory and upto expectations where the hybrids have been planted in agro-climatic regions provisionally recommended as suitable for hybrids and where recommended cultural practices have been followed. The pH of the soils examined was in the range 4.5 - 7.0 and there was no relationship between soil pH and performance of hybrids.

1.4.2 Where the hybrids are marginally successful or complete failures this may be attributed to one of the following factors or a combination of them.

- (a) Unsuitable soil types.
- (b) Premature underplanting.
- (c) Incorrect planting distance.
- (d) Reluctance to thin out the old stand during the first five years of growth of the hybrids.
- (e) Inadequate fertilizer.
- (f) Excessive cattle damage.

In this regard, both the estate owner and the smallholder have made the same mistake particularly regarding (b), (c), (d) and (f) above.

1.4.3 Hybrids showing outstanding growth and yield have been observed in conditions not generally recommended for the cultivation of hybrids. This is due to the intensive care and attention given to the plants and it would be dangerous to generalize on this for the average smallholder may not be able to devote his time or his money for such ventures.

1.4.4 Likewise, in areas which are unsuitable or marginally suitable for hybrids, these have been grown very successfully in pockets e.g. "deniya" or at the bottom of a slope (where the upper portion of the land is a lateritic gravel and therefore unsuitable for hybrids.)

1.4.5 A very small percentage of pure dwarfs was noticed among the hybrid population. It is very unlikely that this situation will arise in the future for the system of emasculation as the Seed Garden has been improved since 1970. As long as the work of the pollination labourers and field attendants is carefully supervised the percentage of pure dwarfs from the seed garden should not be more than 1 - 2% and therefore negligible.

The following recommendations regarding the growing of hybrids have been made to the Coconut Research Board and the Coconut Development Authority :-

1.4.6 Water requirements

- (a) Rainfall: At least 1500 mm (60 inches) per annum, well distributed and without prolonged dry spells.
- (b) Ground Water: High water table 90 cm (3ft) from the surface is not undesirable provided the soil is not heavy.

1.4.7 Soil requirements :

Besides the basic requirements for successful cultivation of coconut palms, the following additional requirements are more specific to hybrids.

- (a) Drainage: Excessive drainage e.g. on red - yellow podsols with hard and compact lateritic gravel, even where the rainfall is adequate may lead to water stress during short periods of drought. This situation has been observed to seriously retard the performance of hybrids when compared with ordinary tall. Such soils are therefore not recommended.
- (b) Soil consistence: Soils that become very hard during dry spells and sticky when moist are not recommended.
- (c) Soil texture: (In order of preference for hybrids) sandy clay loam, sandy loam, loamy sand, loamy sandy clay, sand.
- (d) Soil depth; Effective soil depth (i.e. soil depth without hard and compact gravel or any other impervious layer) should not be less than 0.91 m (36 inches).

1.4.8 Cultural practices :

- (a) Planting density: 157 palms per hectare (64 palms per acre). 7.9 m x 7.9 m (26' x 26') or 123 palms per hectare (50 palms per acre) (10.6 m x 7.3 m (35' x 24') if it is desired to permanently intercrop the plantation.
- (b) Size of seedhole, depth of planting and after-care as for tall variety seedlings.
- (c) Fertilizer application according to CRI leaflet No. 44.
- (d) Thinning of the old stand according to CRI recommendations such that with progressive removal of old palms the entire old stand is removed by the time the underplantation is in reasonably full bearing (usually 5th - 6th year).

1.5. Planting material for a national replanting programme

In view of what is stated in 1.4 above, and as the CRIC 65 hybrid is not the solution for increased productivity in all areas where the coconut can be grown, judicious use will have to be made of the three types of planting material viz. CRIC 65 *typica* x *pumila*, CRIC 60 *typica* x *typica* and *typica* mother palm seedlings in a national replanting programme.

1.6 Mother palm seed supply scheme

The Planting Division nurseries were supplied with 1,851,555 selected mother palm seednuts. The present pool of mother palms resulted from selection work in 1960/61. A programme of systematic re-selection was commenced in 1970 (see Annual Report of the Botanist, 1970), but this was abandoned as drought effects on some of the plantations were very severe.

This year re-selection work was completed at Walahapitiya Estate and Kandewatta Estate and 7653 palms selected as sources of seednut supply. The produce of a large number of mother palms at Kinyama Estate and St. Anne's Estate may not be available due to changes in ownership although negotiations are progressing.

2. COCONUT SEED GARDENS

2.1 Isolated Seed Garden, Ambakelle

Routine maintenance work was carried out in the 135 acres planted during the period 1955 - 1966, as well as in the 80 acres cleared and planted in 1972/73. Yield recording of individual palms, in fields 1-8 was continued, and weighing of husked nuts commenced this year. All sub-standard palms in fields 6 and 7 were identified and destroyed. The system of roguing will be continued over the next few years using the total weight of husked nuts per palm as a further criterion.

2.2 Seed Garden Expansion Project - Ambakelle

30 hectares (75 acres) of jungle were cleared and planted this year. The planting material consisted of dwarfs (*pumila* and *eburnea*) and tall in the ratio of 81:9. About 82 hectares (205 acres) have been cleared under the expansion project and 78 hectares (195 acres) have been planted. The remaining 4 hectares (10 acres) are being used as temporary nurseries, and these too will be planted in 1975 once the Second Seed Garden Project (Horekelly Estate) is completed.

Emasculation work for the mass production of *pumila* x *typica* F₁ hybrids commenced in November but had to be temporarily suspended due to a heavy infestation of Nettle grub, *Parasa lepida*.

2.3 Second Seed Garden, Horrekelly

The survey and demarcation of fields for the Second Seed Garden Horrekelly, was completed late this year, and the replanting programme may be completed by December, 1975.

3. FIELD EXPERIMENTS

The field experiments and observation trials at Bandirippuwa (15) Ratmalagara (8) Pothukulama (10) and Walpita were maintained throughout the year. The growth, flowering and yield data from Field No. 5 at Pothukulama Research Station have been processed and analysed and a paper is being prepared for publication. This experiment, which compares the merits of *typica* x *pumila*, *typica* x *typica* and *typica* (open-pollinated progeny) would provide information which will be useful in selecting the correct planting material for a national replanting programme. (see section 1.5).

4. LABORATORY AND FIELD INVESTIGATIONS

- 4.1 The study of pollen characteristics of the Diallel Cross (Pothukulama) is yet being continued and it may be possible to conclude and analyse this aspect in 1975.
- 4.2 Cyto-genetics of *Brachiaria miliiformis*, *B. brizantha* and *B. mutica*. This investigation which was suspended following the resignation of the Research Assistant in charge of the investigation has been resumed by Mr. V. U. de S. Jayasuriya, Research Assistant.
- 4.3 Effect of quality of male parent on the performance of the resulting *nana* x *typica* F₁ hybrids. Three "types" of pollen parents are used for this investigation:- genetic low-yielders (<20 nuts/palm), high-yielders and prepotent palms. Pollen from these categories of palms is used on the dwarf unit at Ambakelle.
- 4.4 Study of light intensity under different densities of coconut using a short term crop (e.g. Cowpea MI 35) as an indicator plant. This commenced in late November, and the sampling and analysis will be completed in 1975.
- 4.5 Preliminary investigations on tissue culture of coconut (apical buds & flower primordia) in aseptic culture media were carried out under the guidance of Dr. Aries Kooror (Laboratoire de la Differentiation cellulaire, Paris). It has been observed that explants cultured in a medium containing NAA (10⁻⁸-10⁻⁷) and NAA + coconut milk produced more callus than in the other media.
Furthermore, explants from young actively growing seedlings seem able to produce callus, older ones remaining dormant in culture. These studies are being continued.

5. CONFERENCES, PUBLICATIONS ETC

- 5.1 The Botanist addressed the Staff Research Conference on "a recent survey of the performance of *typica* x *pumila* F₁ hybrids grown under different agro-climatic conditions."
- 5.2 The Botanist presented the following papers at the 30th Annual Sessions of the Ceylon Association for the Advancement of Science, December, 1974.
 - (1) An improved method of storage of coconut pollen.
 - (2) Intra-specific hybridization in coconut *Cocos nucifera* L. San Ramon x Dwarf F₁ hybrids.

6. PERSONNEL :-

Mr. V. U. de S. Jayasuriya and Mrs. S. M. Karunaratne were appointed as Research Assistants.
Miss M. C. L. Fernando was appointed as Technical Assistant. Mr. R. L. A. Perera, Field Attendant, was promoted as Field Assistant and Mr. J. A. Hubert was appointed as a Field Attendant.

Dr. M. A. P. MANTHRIRATNA
Botanist.

REPORT OF THE CHEMISTRY DIVISION (1974)

1. STUDY ON DIURNAL AND SEASONAL FLUCTUATIONS OF NUTRIENTS IN FOLIAR TISSUES.

Details of the sampling procedure for the above study have already been reported in the earlier annual reports.

The analytical work on the 1800 samples collected to study the diurnal and seasonal fluctuation in nutrient concentration in the *variety typica form typica*, to fix the ideal time of leaf sampling for foliar diagnostic analysis was continued during the year.

(Of the 1800 samples collected under this experiment 1450 samples have already been analysed for nitrogen and 500 samples for phosphorus, potassium, sodium, calcium and magnesium.)

The slow progress in analysing the samples for sodium, calcium, and magnesium was due to a technical fault in the Atomic Absorption Spectrometer, which has now been traced to a defective photomultiplier tube. As a replacement has to be imported, it is envisaged that the analysis is going to be inordinately delayed. In view of this it was decided to analyse for Ca and Mg by the EDTA titration method and to abandon estimation for Na.

2. STUDY OF THE ANNUAL EXHAUST OF SOIL NUTRIENTS.

The Botanist's hybrid palm block, 0.82 ha in extent, containing 124 *typica* x *pumila* hybrid palms, was chosen for the study of the annual exhaust of nutrients from the soils by these hybrids.

The experimental area chosen was a well drained sandy loam soil fertilized with C.R.I. "C" mixture containing 10.3% N, 5.5% of P_2O_5 and 18.0% of K_2O . The fertilizers were applied in two split doses of 2.25 kg each during May/June and October/ November.

Commencing from the estate pick for May/June 1973, at bimonthly intervals a study was made to estimate the annual removal of the major nutrients. The study was concluded with the final pick in March/April 1974. Plant analysis in connection with this study covered the sampling of fallen fronds, fallen nuts and the nuts in the first and second clusters. At each pick, 10% of each category of nuts, together with 10% of the fallen fronds were taken for sampling, representing the chosen site.

The nuts were separated into their components, husk, shell, kernel and nut water and a representative sample obtained for moisture estimation and chemical analysis. The fronds were separated into the rachis, midrib and lamina to obtain samples for moisture estimation and chemical analysis.

Standard analytical procedures were adopted for the estimation of nitrogen, phosphorus, potassium, calcium and magnesium and the results expressed as a percentage of the dry matter.

The concentration values and the dry weights of the components were combined to give the absolute amount of each of the elements, expressed on the basis of a nut.

The amount of nutrients removed by a single nut from each of the three categories and by a single frond, for the six harvests from May 1973 to April 1974 are tabulated in Tables 1 to 6. A record of nuts and fronds collected during the same period is given in Table 7. Combining these data, the estimated total amounts of nutrients removed by the six harvests, May-June 1973, July-August 1973, September - October 1973, November - December 1973, January - February 1974 and March-April 1974, together with the total estimated amounts of nutrients for the 12 month period May 1973 to April 1974 are tabulated in Table 8.

From Table 8 the annual removal of the major nutrients expressed in terms of a planting density of 64 palms to 0.4ha (1 acre) was worked and expressed in Table 9.

From the results in Table 9, the total amounts of N, P and K removed by the nuts and foliage were 50, 7 and 98 kg/ha respectively. The amounts of N, P and K made available annually by the addition of fertilizer were 74, 17 and 107 kg/ha. It appears from the data that the amount of fertilizer added is sufficient to meet the loss of N and P but the same cannot be said of K.

The loss of Ca and Mg amounts to 27 and 13 kg/ha and no specific fertilizer mixture has been added to offset the loss. However, as for Ca a certain proportion may be obtained from saphos phosphate added but no such replenishment occurs for Mg.

3. TODDY YIELDS FROM HYBRID PALMS.

A study was made to verify whether toddy yield from *typica* x *pumila* F hybrid palm would meet the requirements of the fermentation industry once they replace the *typica* in the replanting scheme.

Yield records of toddy on 12 hybrid palms, selected from the Botanist's field No. 16 at Bandirippuwa Estate, Lunuwila, were maintained for a period of 12 months from May 1973 to April 1974.

The yield records of each of the 12 palms were maintained separately and it was observed that the average daily yields per palm during the tapping period range between 1760 ml and 2477 ml. The monthly averages of the daily yields are summarised in Table 10 from which the overall average daily yield per palm will be seen to be 2177 ml (Approximately 2.27 litres, half a gallon or 3 bottles.)

Table 11 shows yield records maintained for each of the spadix for every palm tapped from which it is observed that the average yield per spadix per palm ranges from 38.1 litres to 53.3 litres. The overall average per spathe during the tapping period was 44.8 litres (approximately 45.50 litres or 10 gallons).

From this study it is concluded that for the fermentation industry, the *typica* x *pumila* (F) hybrid palms could adequately replace *typica* variety, under conditions suitable for the hybrids.

4. EFFECT OF IRRIGATION OF LEAF NUTRIENT CONCENTRATION

An experiment commenced by the Biometrician in 1973 to study the effect of differential irrigation on yield of palms with a standard fertilizer treatment was used to investigate possible changes in concentration of nutrients within the leaf as a result of irrigation.

The first sampling was done on 6th September, 1974. Samples were collected from the mid portion of the 14th leaf and the chemical analysis pertaining to this study is in progress.

5. MATURATION AND CLARIFICATION OF DISTILLED SPIRITS DERIVED FROM TODDY.

In order to study the changes in chemical constituents and flavour characteristics of arrack on storage, the toddy distillates were kept in different types of containers, bottles, pots, wooden barrels and in bottles treated with activated carbon and cinnamon wood.

These samples were analysed for their alcoholic strength, acidity and esters at the end of every two months. It was observed that there was a marked increase in acidity in all samples but esters failed to display any regular pattern. The samples were also analysed for aldehydes methanol and furfural every three months.

Unfortunately the experiment had to be abandoned owing to the loss of distillates from the earthenware pots and barrels. It is intended to repeat this experiment.

6. PRESERVATION, BOTTLING AND KEEPING QUALITIES OF FRESH COCONUT SAP (SWEET TODDY)

A method for preserving and bottling fresh coconut sap (sweet toddy) to be used as a substitute sugar solution for the preparation of beverages was successfully completed.

Samples of sweet toddy from selected coconut palms collected in polythene bags at three hourly and twelve hourly intervals have been used for this study.

Chemical food preservatives were found ineffective in their maximum concentration permitted by the Food and Drugs Act. Freeze drying also gave negative results. The method of heat sterilisation was found to be most satisfactory in destroying micro-organisms and enzymes.

Samples of sweet toddy were bottled (using Lanka Glass Co. bottles, having a capacity of about 200 ml and weighing about 235 g each) at 60°C, 70°C, 80°C and 90°C with exposure times of 5, 10, 15, 20, 25 and 30 minutes. Heat sterilization at 80°C for 25 minutes (and at 90°C for 20 minutes) was found to be most satisfactory and kept for a period of six months.

The flavour characteristics and the analytical data pertaining to these studies are charted in Tables 12 to 17.

7. PREPARATION AND IMPROVING THE QUALITY OF TREACLE AND JAGGERY.

Fresh coconut sap was used as base for the preparation of treacle and jaggery.

For the preparation of treacle 5 g (1 table spoonful) of finely cut "Hal" bark (*veteria acuminata*) are added into the above heat sterilized pot. For the preparation of jaggery however in addition to the 'Hal' bark about 5 g (1 teaspoonful) of lime are also added. The quantities mentioned above are generally adequate when about 1-1½ bottles of sweet toddy are collected. The pot prepared in this manner is taken up to the palm and attached to the spathe. Precaution should however be taken to ensure that the 'cut end' of the spathe does not come into contact with lime which could damage the spathe.

It is important to mention that two separate collections of sweet toddy should be made every day viz. in the morning (about 7.00 a.m.) and in the evening (about 4.00 pm). In each operation the pot should be heat sterilised and fresh antiferments ('Hal' bark/lime) used each time.

Coconut treacle

The sweet toddy obtained by adding 'Hal' bark is filtered through suitable cloth or 'stay-brite' steel mesh to remove, coarse impurities such as insects, bark or vegetable matter from the spathe.

The product is next decanted into a boiling pan and heated without delay. The sweet toddy will remain around 100°C until it begins to thicken when the temperature will slowly rise to 100°C or so. When this stage is reached, the treacle recovered would represent approximately 1/6th of the original volume. In practice it has been found that, this degree of evaporation is necessary to obtain treacle of the correct consistency. The finished product should be kept closed to avoid contamination (especially from moulds).

Coconut Jaggery

The raw material for jaggery making (viz. sweet toddy) collected as mentioned above in heat sterilized pots treated with lime, containing the pre-determined quantity of 'Hal' bark, is first strained to remove coarse impurities. At this stage the acidity of the liquid should be tested using PH paper (range 1-14). If the PH is below 7.1 the sweet toddy would be not suitable for the preparation of jaggery. However, treacle could be made from such sweet toddy.

The clean sap (having a PH of 7.1 and above) is next decanted without delay into a boiling pan (after allowing the excess lime to settle down) and heated till the temperature reaches about 75°C in 30-45 mts. If the PH of the liquid is above 7, it should be brought down to 7.1. This can be accomplished by removing the excess lime present by the use of a suitable de-liming agent. For this purpose we recommend the use of a saturated solution of Triple Super Phosphate (TSP) on a guaranteed analysis, OR in the alternative undiluted lemon juice (citrus). These should be added in small quantities at a time at this temperature. If the PH is already around 7.1 there would be no need for this de-liming treatment.

The mixture is then transferred to a suitable utensil or settling tank, and the precipitate (sediment) is separated from the clear supernatant liquid.

The de-limed clear solution is next transferred to a boiling pan and heated slowly with occasional stirring. When the temperature reaches 117°C - 120°C the heating is slowed down and the solution is stirred well, to avoid caramelization of the sugar. When the correct consistency is reached (to be judged by experience) the semi-liquid product is poured into moulds of appropriate sizes and set aside to harden into jaggery.

8. CHANGES IN ANALYTICAL CHARACTERISTICS OF FRESH COCONUT SAP ON FERMENTATIONS

Preliminary studies have commenced to observe the changes in characteristics of fresh coconut sap on fermentation. Observations are being made on taste, flavour, density, PH, acidity (as acetic), alcohol, sucrose, invert sugars, total solids and ash with a view to studying these changes and their interrelationship.

PERSONNEL.

Messrs P.A.D.G. Appuhamy, B.J.A.F. Mendis and G.D. George, Technical Assistants, completed the Laboratory Technicians' Training Course conducted by the Institute of Chemistry, Sri Lanka. Mr. M.C.P. Wijeratne, Technical Assistant, is following the same course commencing from June, 1974. Mr. B.C.N. Peiris was appointed Technical Assistant with effect from 1st August, 1974.

Mr. J. E. Premaratne, Attendant (Tapper), has reverted to his substantive post after serving the Toddy Tappers Training Scheme as instructor for a period of one year (1973).

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

Table 1.

Amount (g) of mineral elements in the fruit components of the fallen, first bunch and second bunch nuts at time of harvest and in the components of the fallen fronds collected at end of harvest in the hybrid palms.

| Harvest May/June 1973 | | | | | |
|-----------------------|-------------------|---------------------|--------------------|--------------------|----------------------|
| Components | Nitrogen (asN) | Phosphorus (asP) | Potassium (asK) | Calcium (as Ca) | Magnesium (as Mg) |
| DEAD RIPE FALLEN NUTS | | | | | |
| Husk | 0.394 | 0.094 | 4.829 | 0.577 | 0.326 |
| Shell | 0.473 | 0.013 | 0.478 | 0.085 | 0.029 |
| Kernel | 2.195 | 0.317 | 1.466 | 0.022 | 0.192 |
| Nut water | 0.028 | 0.019 | 0.138 | 0.023 | 0.032 |
| Total / nut | 3.090 | 0.443 | 6.911 | 0.707 | 0.579 |
| FIRST BUNCH NUTS | | | | | |
| Husk | 0.386 | 0.121 | 5.345 | 0.641 | 0.331 |
| Shell | 0.428 | 0.012 | 0.431 | 0.058 | 0.021 |
| Kernel | 2.202 | 0.329 | 1.428 | 0.021 | 0.187 |
| Nut water | 0.029 | 0.016 | 0.276 | 0.033 | 0.023 |
| Total/nut | 3.045 | 0.478 | 7.480 | 0.753 | 0.562 |
| SECOND BUNCH NUTS | | | | | |
| Husk | 0.374 | 0.106 | 5.822 | 0.462 | 0.320 |
| Shell | 0.434 | 0.012 | 0.394 | 0.052 | 0.011 |
| Kernel | 2.190 | 0.329 | 1.374 | 0.018 | 0.186 |
| Nut water | 0.023 | 0.021 | 0.552 | 0.043 | 0.026 |
| Total/nut | 3.021 | 0.468 | 8.142 | 0.575 | 0.543 |
| FALLEN FRONDS | | | | | |
| Rachis | 1.943 | 1.148 | 16.642 | 24.713 | 5.899 |
| Mid-rib | 0.998 | 0.267 | 0.701 | 1.325 | 0.491 |
| Lamina | 7.694 | 0.661 | 2.086 | 6.800 | 1.787 |
| Total/frond | 10.635 | 2.076 | 19.429 | 32.838 | 8.177 |

Table 2.

Amount (g) of mineral elements in the fruit components of the fallen, first bunch and second bunch nuts at time of harvest and in the components of the fallen fronds collected at end of harvest in the hybrid palms.

| Harvest July/August 1973 | | | | | |
|--------------------------|--------------------|----------------------|---------------------|--------------------|----------------------|
| Components | Nitrogen (as N) | Phosphorus (as P) | Potassium (as K) | Calcium (as Ca) | Magnesium (as Mg) |
| DEAD RIPE FALLEN NUTS | | | | | |
| Husk | 1.018 | 0.113 | 5.198 | 0.378 | 0.323 |
| Shell | 0.061 | 0.012 | 0.442 | 0.057 | 0.023 |
| Kernel | 2.663 | 0.432 | 1.573 | 0.060 | 0.212 |
| Nut water | 0.031 | 0.020 | 0.545 | 0.032 | 0.020 |
| Total/Nut | 3.773 | 0.577 | 7.758 | 0.527 | 0.578 |

FIRST BUNCH NUTS

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Husk | 0.895 | 0.082 | 5.347 | 0.395 | 0.309 |
| Shell | 0.211 | 0.012 | 0.430 | 0.053 | 0.023 |
| Kernel | 2.375 | 0.389 | 1.376 | 0.030 | 0.223 |
| Nut water | 0.033 | 0.016 | 0.456 | 0.048 | 0.019 |
| Total/nut | 3.514 | 0.499 | 7.609 | 0.526 | 0.574 |

SECOND BUNCH NUTS

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Husk | 1.262 | 0.117 | 7.150 | 0.461 | 0.431 |
| Shell | 0.349 | 0.012 | 0.449 | 0.094 | 0.059 |
| Kernel | 2.302 | 0.354 | 1.232 | 0.023 | 0.207 |
| Nut water | 0.028 | 0.017 | 0.553 | 0.039 | 0.022 |
| Total/nut | 3.941 | 0.500 | 9.384 | 0.617 | 0.719 |

FALLEN FRONDS

| | | | | | |
|-------------|--------|-------|--------|--------|-------|
| Rachis | 6.792 | 0.639 | 8.262 | 19.784 | 6.123 |
| Mid-rib | 1.586 | 0.124 | 0.896 | 1.040 | 0.564 |
| Lamina | 5.766 | 0.410 | 2.152 | 4.265 | 1.969 |
| Total/frond | 14.144 | 1.173 | 11.310 | 25.089 | 8.656 |

Table 3

Amount (g) of mineral elements in the fruit components of the fallen, first bunch and second bunch nuts at time of harvest and in the components of the fallen fronds collected at end of harvest in the hybrid palms.

Harvest September/October 1973

| Components | Nitrogen (as N) | Phosphorus (as P) | Potassium (as K) | Calcium (as Ca) | Magnesium (as Mg) |
|------------------------------|--------------------|----------------------|---------------------|--------------------|----------------------|
| DEAD RIPE FALLEN NUTS | | | | | |
| Husk | 0.829 | 0.089 | 4.447 | 0.471 | 0.360 |
| Shell | 0.284 | 0.016 | 0.385 | 0.030 | 0.042 |
| Kernel | 1.976 | 0.403 | 1.443 | 0.034 | 0.193 |
| Nut water | 0.028 | 0.014 | 0.249 | 0.045 | 0.025 |
| Total/nut | 3.117 | 0.522 | 6.524 | 0.580 | 0.620 |
| FIRST BUNCH NUTS | | | | | |
| Husk | 1.088 | 0.099 | 5.163 | 0.417 | 0.335 |
| Shell | 0.248 | 0.021 | 0.403 | 0.060 | 0.029 |
| Kernel | 2.170 | 0.420 | 1.434 | 0.028 | 0.206 |
| Nut water | 0.037 | 0.019 | 0.276 | 0.053 | 0.030 |
| Total nut | 3.543 | 0.559 | 7.276 | 0.558 | 0.600 |
| SECOND BUNCH NUTS | | | | | |
| Husk | 0.983 | 0.117 | 5.304 | 0.439 | 0.336 |
| Shell | 0.334 | 0.023 | 0.380 | 0.069 | 0.030 |
| Kernel | 2.154 | 0.396 | 1.368 | 0.027 | 0.170 |
| Nut water | 0.057 | 0.013 | 0.231 | 0.047 | 0.024 |
| Total/nut | 3.528 | 0.549 | 7.283 | 0.582 | 0.560 |

FALLEN FRONDS

| | | | | | |
|-------------|-------|-------|-------|--------|-------|
| Rachis | 1.269 | 0.398 | 4.890 | 14.561 | 4.153 |
| Mid-rib | 0.742 | 0.097 | 0.647 | 1.000 | 0.479 |
| Lamina | 5.639 | 0.388 | 2.032 | 4.053 | 1.551 |
| Total/frond | 7.650 | 0.883 | 7.569 | 19.614 | 6.183 |

Table 4

Amount (g) of mineral elements in the fruit components of the fallen, first bunch and second bunch nuts at time of harvest and in the components of the fallen fronds collected at end of harvest in the hybrid palms.

Harvest November/December 1973

| Components | Nitrogen (as N) | Phosphorus (as P) | Potassium (as K) | Calcium (as Ca) | Magnesium (as Mg) |
|------------------------------|--------------------|----------------------|---------------------|--------------------|----------------------|
| DEAD RIPE FALLEN NUTS | | | | | |
| Husk | 1.505 | 0.045 | 4.296 | 0.578 | 0.339 |
| Shell | 0.099 | 0.015 | 0.414 | 0.051 | 0.013 |
| Kernel | 2.230 | 0.360 | 1.398 | 0.016 | 0.181 |
| Nut water | 0.024 | 0.019 | 0.223 | 0.023 | 0.016 |
| Total/nut | 3.858 | 0.439 | 6.331 | 0.668 | 0.549 |
| FIRST BUNCH NUTS | | | | | |
| Husk | 0.876 | 0.059 | 6.406 | 0.648 | 0.362 |
| Shell | 0.140 | 0.012 | 0.382 | 0.067 | 0.011 |
| Kernel | 2.570 | 0.431 | 1.537 | 0.016 | 0.183 |
| Nut water | 0.032 | 0.023 | 0.337 | 0.028 | 0.018 |
| Total/nut | 3.618 | 0.525 | 8.662 | 0.759 | 0.574 |
| SECOND BUNCH NUTS | | | | | |
| Husk | 0.745 | 0.050 | 5.711 | 0.568 | 0.314 |
| Shell | 0.171 | 0.020 | 0.470 | 0.044 | 0.014 |
| Kernel | 1.505 | 0.401 | 1.404 | 0.017 | 0.187 |
| Nut water | 0.043 | 0.041 | 0.394 | 0.033 | 0.021 |
| Total/nut | 2.464 | 0.512 | 7.979 | 0.662 | 0.536 |
| FALLEN FRONDS | | | | | |
| Rachis | 5.195 | 0.516 | 9.124 | 18.032 | 8.691 |
| Mid-rib | 1.424 | 0.118 | 0.454 | 1.232 | 0.627 |
| Lamina | 6.642 | 0.784 | 2.547 | 4.740 | 1.895 |
| Total/frond | 13.261 | 1.418 | 12.125 | 24.004 | 11.213 |

Table 5

Amount (g) of mineral elements in the fruit components of the fallen, first bunch and second bunch nuts at time of harvest and in the components of the fallen fronds collected at end of harvest in the hybrid palms.

Harvest January/February 1974

| Components | Nitrogen (as N) | Phosphorus (as P) | Potassium (as K) | Calcium (as Ca) | Magnesium (as Mg) |
|------------------------------|--------------------|----------------------|---------------------|--------------------|----------------------|
| DEAD RIPE FALLEN NUTS | | | | | |
| Husk | 0.819 | 0.058 | 4.608 | 0.352 | 0.269 |
| Shell | 0.267 | 0.009 | 0.366 | 0.034 | 0.023 |

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Kernel | 2.494 | 0.432 | 1.591 | 0.032 | 0.204 |
| Nut water | 0.073 | 0.051 | 0.352 | 0.029 | 0.020 |
| Total/nut | 3.653 | 0.550 | 6.917 | 0.447 | 0.516 |

FIRST BUNCH NUTS

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Husk | 0.877 | 0.099 | 6.349 | 0.400 | 0.352 |
| Shell | 0.316 | 0.014 | 0.412 | 0.064 | 0.026 |
| Kernel | 2.621 | 0.411 | 1.482 | 0.031 | 0.189 |
| Nut water | 0.082 | 0.045 | 0.470 | 0.031 | 0.016 |
| Total/nut | 3.896 | 0.569 | 8.713 | 0.526 | 0.583 |

SECOND BUNCH NUTS

| | | | | | |
|-----------|-------|-------|--------|-------|-------|
| Husk | 1.025 | 0.107 | 8.039 | 0.385 | 0.343 |
| Shell | 0.236 | 0.016 | 0.428 | 0.064 | 0.023 |
| Kernel | 2.081 | 0.336 | 1.254 | 0.023 | 0.158 |
| Nut water | 0.055 | 0.036 | 0.348 | 0.021 | 0.008 |
| Total/nut | 3.397 | 0.495 | 10.069 | 0.493 | 0.532 |

FALLEN FRONDS

| | | | | | |
|-------------|--------|-------|-------|--------|-------|
| Rachis | 2.628 | 0.446 | 3.564 | 14.122 | 5.435 |
| Mid-rib | 1.377 | 0.093 | 0.728 | 1.397 | 0.741 |
| Lamina | 7.160 | 0.483 | 2.176 | 4.434 | 1.897 |
| Total/frond | 11.165 | 1.022 | 6.468 | 19.953 | 8.073 |

Table 6

Amount (g) of mineral elements in the fruit components of the fallen, first bunch and second bunch nuts at time of harvest and in the components of the fallen fronds collected at end of harvest in the hybrid palms.

Harvest March/April 1974

| Components | Nitrogen (as N) | Phosphorus (as P) | Potassium (as K) | Calcium (as Ca) | Magnesium (as Mg) |
|------------|--------------------|----------------------|---------------------|--------------------|----------------------|
|------------|--------------------|----------------------|---------------------|--------------------|----------------------|

DEAD RIPE FALLEN NUTS

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Husk | 1.115 | 0.139 | 4.224 | 0.551 | 0.337 |
| Shell | 0.439 | 0.016 | 0.391 | 0.066 | 0.044 |
| Kernel | 2.840 | 0.439 | 1.716 | 0.028 | 0.140 |
| Nut water | 0.071 | 0.026 | 0.353 | 0.212 | 0.141 |
| Total/nut | 4.465 | 0.620 | 6.684 | 0.857 | 0.662 |

FIRST BUNCH NUTS

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Husk | 0.529 | 0.106 | 5.069 | 0.451 | 0.249 |
| Shell | 0.571 | 0.021 | 0.477 | 0.067 | 0.028 |
| Kernel | 2.635 | 0.409 | 1.348 | 0.039 | 0.106 |
| Nut water | 0.059 | 0.024 | 0.331 | 0.020 | 0.092 |
| Total/nut | 3.794 | 0.560 | 7.225 | 0.577 | 0.475 |

SECOND BUNCH NUTS

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Husk | 0.580 | 0.109 | 6.922 | 0.368 | 0.317 |
| Shell | 0.571 | 0.015 | 0.464 | 0.049 | 0.032 |
| Kernel | 2.465 | 0.367 | 1.241 | 0.035 | 0.102 |
| Nut water | 0.066 | 0.026 | 0.402 | 0.020 | 0.080 |
| Total/nut | 3.682 | 0.517 | 9.029 | 0.472 | 0.531 |

FALLEN FRONDS

| | | | | | |
|-------------|--------|-------|-------|--------|-------|
| Rachis | 6.054 | 0.486 | 3.241 | 14.656 | 3.668 |
| Mid-rib | 1.495 | 0.075 | 0.546 | 1.058 | 0.641 |
| Lamina | 6.451 | 0.385 | 1.425 | 4.435 | 1.797 |
| Total/frond | 14.000 | 0.946 | 5.212 | 20.149 | 6.106 |

Table 7. *Record of nuts and fronds collected during the period May 1973 - April 1974*

| <i>Nut types and fronds Harvest</i> | <i>Fallen nuts</i> | <i>1st bunch nuts</i> | <i>2nd bunch nuts</i> | <i>FronDS</i> |
|---|--------------------|-----------------------|-----------------------|---------------|
| May - June 1973 | 322 | 1062 | 1023 | 84 |
| July-August 1973 | 256 | 932 | 600 | 173 |
| September-October 1973 | 230 | 434 | 276 | 118 |
| November-December 1973 | 70 | 446 | 339 | 86 |
| January-February 1974 | 46 | 611 | 476 | 35 |
| March-April 1974 | 164 | 820 | 1075 | 190 |
| Total | 1088 | 4305 | 3789 | 686 |

Table 8. *Estimated amounts (g) of nutrients removed by the nuts and fronds during the period May 1973 – April 1974 in the T X D hybrids.*

| ELEMENTS | HARVEST | NITROGEN (as N) | | PHOSPHORUS (as P) | | POTASSIUM (as K) | | CALCIUM (as Ca) | | MAGNESIUM (as Mg) | | |
|----------|--------------------------|--------------------|--------|----------------------|--------|---------------------|--------|--------------------|--------|----------------------|--------|------|
| | | Nuts | Fronds | Nuts | Fronds | Nuts | Fronds | Nuts | Fronds | Nuts | Fronds | |
| | May – June 1973 | .. | 7322 | 893 | 1128 | 174 | 17571 | 1632 | 1615 | 2758 | 1338 | 687 |
| | July – August 1973 | .. | 6606 | 2447 | 912 | 202 | 13795 | 1956 | 995 | 4341 | 1114 | 1497 |
| | September–October 1973 | .. | 3228 | 903 | 513 | 104 | 6184 | 893 | 535 | 2314 | 558 | 730 |
| | November – December 1973 | .. | 2719 | 1140 | 436 | 121 | 6639 | 1043 | 610 | 2064 | 540 | 964 |
| | January – February 1974 | .. | 4165 | 165 | 608 | 36 | 9843 | 226 | 575 | 698 | 632 | 282 |
| | March – April 1974 | .. | 7803 | 2660 | 1117 | 179 | 15964 | 991 | 1123 | 3829 | 1068 | 1160 |
| | TOTAL | .. | 31843 | 8208 | 4714 | 816 | 69996 | 6741 | 5453 | 16004 | 5250 | 5320 |

Table 9. *Estimate of the annual removal of major plant nutrients from the soil by the T x D hybrid coconut palm. (Planting density - 64 palms/acre)*

| N | | P | | K | | Ca | | Mg. | |
|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|
| lbs/acre | Kg/ha | lbs/acre | kg/ha | lbs/acre | Kg/ha | lbs/acre | Kg/ha | lbs/acre | Kg/ha |
| 45 | 50 | 6 | 7 | 87 | 98 | 24 | 27 | 12 | 13 |

| N | | P ₂ O ₅ | | K ₂ O | | CaO | | MgO | |
|----------|-------|-------------------------------|-------|------------------|-------|----------|-------|----------|-------|
| lbs/acre | Kg/ha | lbs/acre | Kg/ha | lbs/acre | Kg/ha | lbs/acre | Kg/ha | lbs/acre | Kg/ha |
| 45 | 50 | 14.0 | 16.0 | 105 | 118 | 34 | 38 | 20 | 22 |

Table 10. *Monthly averages of daily yield per palm*

| Month | Yield of sap (ml) | | |
|--|-------------------|----|------|
| May 1973 | .. | .. | 1637 |
| June 1973 | .. | .. | 2063 |
| July 1973 | .. | .. | 2391 |
| August 1973 | .. | .. | 2133 |
| September 1973 | .. | .. | 2283 |
| October 1973 | .. | .. | 2331 |
| November 1973 | .. | .. | 1956 |
| December 1973 | .. | .. | 2057 |
| January 1974 | .. | .. | 2248 |
| February 1974 | .. | .. | 1878 |
| March 1974 | .. | .. | 2270 |
| April 1974 | .. | .. | 2780 |
| Overall average daily yield per palm 12 months (May/April) | .. | .. | 2177 |

Table 11. Variation in the production of Toddy per Spadix (Volume in millilitres)
Records kept during the period May 1973 to 1974 on *Typica* × *Nana* Hybrids (A to L) at Bändirippuwa Estate, Lunuwila

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|
| Spadix No. | Palm A | Palm B | Palm C | Palm D | Palm E | Palm F | Palm G | Palm H | Palm I | Palm J | Palm K | Palm L | Average yield per spadix for 12 plms |
| 1 | 66380 | 42420 | 41380 | 35400 | 51770 | 3010 | 39200 | 44250 | 53695 | 45150 | 60870 | 46050 | 47870 |
| 2 | 10155 | 32035 | 50090 | 37460 | 28430 | 36470 | 59030 | 46830 | 40530 | 41590 | 42680 | 32930 | 38186 |
| 3 | 46410 | 51860 | 50140 | 45990 | 60700 | 29365 | 74850 | 69980 | 53720 | 46910 | 52650 | 55660 | 53186 |
| 4 | 46050 | 55920 | 51290 | 37260 | 70140 | 35370 | 50600 | 35580 | 58780 | 49540 | 44490 | 46590 | 48468 |
| 5 | 47350 | 66030 | 54910 | 40600 | 8180 | 44970 | 57510 | 42730 | 70560 | 58960 | 29360 | 27180 | 49105 |
| 6 | 63000 | 31850 | 19640 | 66900 | 36970 | 34950 | 62280 | 54090 | 45680 | 47130 | 69280 | 66560 | 49861 |
| 7 | 61440 | 45840 | 53540 | 41120 | 40030 | 35960 | 51180 | 46170 | 49310 | 60280 | 45840 | 27640 | 46529 |
| 8 | 41030 | 53945 | 38320 | 34550 | 48540 | 33740 | 77380 | 54620 | 42960 | 52050 | 32520 | 59580 | 47436 |
| 9 | 59620 | — | 44210 | 40770 | 45260 | 38560 | 60400 | 41460 | 65140 | 38840 | 30500 | 52240 | 47090 |
| 10 | 33020 | 57360 | 46700 | 38780 | 57720 | 47810 | 55620 | 42270 | 40040 | 46000 | 53600 | 39620 | 46545 |
| 11 | 55770 | 37860 | 52734 | 35260 | 33760 | 44830 | 55850 | 39390 | 63120 | 38400 | 43840 | 68200 | 46835 |
| 12 | 59680 | 39840 | 54750 | 56840 | 77440 | 30730 | 68170 | 57040 | 36940 | 55960 | 36560 | 45880 | 51653 |
| 13 | 46840 | 39980 | 32190 | 27430 | 22120 | 60850 | 34560 | 34370 | 2920 | 37700 | 42920 | 45250 | 38565 |
| 14 | 45220 | 39400 | 62980 | 20350 | 107180 | 44100 | 31880 | 44510 | 38940 | 38220 | 40550 | 62370 | 47975 |
| 15 | 59400 | 16340 | 43880 | 43760 | 64280 | 70710 | 63850 | 51040 | 57020 | 51760 | 47740 | 38280 | 50663 |
| 16 | 49450 | 30715 | 62960 | 37280 | 43930 | 41200 | 47170 | 44720 | 46610 | 49700 | 41920 | 67780 | 46952 |
| 17 | 40810 | 2770 | 31700 | 37600 | 5980 | 58590 | 13100 | 49260 | 11090 | 27240 | 45740 | 30730 | 29552 |
| 18 | 38090 | — | — | 32730 | — | 76860 | — | 28210 | — | 5045 | 31290 | 12010 | 32034 |
| 19 | — | — | — | 15520 | — | 28000 | — | — | — | — | — | — | 21760 |
| Total for 365 days (ml) | 869715 | 644165 | 791410 | 725600 | 802430 | 796075 | 905639 | 826520 | 777055 | 790475 | 793350 | 814450 | Average of total for 365 days 794741 (12 palms) |
| Aver. volume for spathe (ml) excluding first and last spathes tapped | 47828 | 42784 | 47889 | 39697 | 49645 | 45003 | 56899 | 47129 | 47485 | 46268 | 43824 | 47274 | 46810 |
| Aver. volume for spathe (ml) all spathes tapped | 48318 | 38792 | 46554 | 38189 | 47202 | 41899 | 53273 | 45918 | 45709 | 43915 | 44075 | 45247 | 44849 |

794,741 = 17.7 spathes per 365 days.

44,849 i.e. 1 spathe was tapped for 20.6 days (approx.)

Table 12.

3 hours and 12 hours respectively from the time the receiving vessel is attached to the spathe.

| Examined for | iii hours | xii hours |
|--|-------------|---------------------|
| 1. Colour | Light Amber | Whitish |
| 2. Taste | Very Sweet | Sweet and Agreeable |
| 3. Flavour | Pleasant | Very Pleasant |
| 4. Density (t/t) | 1.09 | 1.08 |
| 5. % Total Solids | 18.90 | 18.40 |
| 6. % Total Sugars (as sucrose) | 15.40 | 9.80 |
| 7. % Invert Sugars | 0.70 | 5.47 |
| 8. % Alcohol (v/v) | Nil | Trace |
| 9. % Acidity (as Acetic) | Trace | 0.25 |
| 10. pH | 7.2 | 3.80 |
| 11. % Nitrogen (as N) | 0.03 | 0.03 |
| 12. % Phosphorus (as P ₂ O ₅) | 0.02 | 0.02 |
| 13. % Potassium (as K ₂ O) | 0.16 | 0.16 |
| 14. % Calcium (as Ca) | 0.002 | 0.002 |
| 15. % Magnesium (as Mg) | 0.004 | 0.004 |

Table 13.

Details of a set comprising xxiv samples

| °C | Exposure time in minutes | | | | | |
|----|--------------------------|----|----|----|----|----|
| | 5 | 10 | 15 | 20 | 25 | 30 |
| 60 | 5 | 10 | 15 | 20 | 25 | 30 |
| 70 | 5 | 10 | 15 | 20 | 25 | 30 |
| 80 | 5 | 10 | 15 | 20 | 25 | 30 |
| 90 | 5 | 10 | 15 | 20 | 25 | 30 |

Table 14.

Sterilization at 60°C

| Exposure time Minutes | Examined for | I Month | II Month | III Month | IV Month | V Month | VI Month |
|--------------------------|--|----------------------------|-----------------------------|--------------|-------------|------------|-------------|
| 15 | (a) Observation | Mild Effer- vescence | Brisk Effer- vescence | B.E. | B.E. | B.E. | B.E. |
| | (b) Taste (Original Sweet) | Slightly Sour | S.S. | S.S. | Sour | S. | S. |
| | (c) % increase in Alcohol (Over Original) | 1.10 | 2.0 | 3.20 | 3.90 | 4.20 | 4.50 |

| | | | | | | | |
|----|---|--------------------|--------|--------|--------|--------|--------|
| | (d) % increase in Acidity (over Original) | 0.73 | 0.87 | 1.00 | 1.12 | 1.28 | 1.41 |
| 10 | (a) | Effervescence | B.E. | B.E. | B.E. | B.E. | B.E. |
| | (b) | Very slightly sour | S.S. | S.S. | S. | S. | S. |
| | (c) | — | 1.40 | 1.60 | 1.60 | 2.30 | 3.50 |
| | (d) | 0.67 | 0.75 | 0.86 | 0.90 | 1.10 | 1.20 |
| 15 | (a) | — | — | E | B.E. | B.E. | B.E. |
| | (b) | V.S.S. | V.S.S. | V.S.S. | S.S. | S.S. | S. |
| | (c) | — | — | — | 0.30 | 0.40 | 1.50 |
| | (d) | 0.59 | 0.60 | 0.71 | 0.75 | 0.90 | 1.04 |
| 20 | (a) | — | — | — | — | E. | E. |
| | (b) | — | — | V.S.S. | S.S. | S.S. | S.S. |
| | (c) | — | — | — | 0.20 | 0.50 | 1.45 |
| | (d) | 0.46 | 0.54 | 0.60 | 0.62 | 0.75 | 0.83 |
| 25 | (a) | — | — | — | — | — | — |
| | (b) | — | — | V.S.S. | V.S.S. | V.S.S. | V.S.S. |
| | (c) | — | — | — | — | 0.10 | 0.60 |
| | (d) | 0.39 | 0.47 | 0.49 | 0.50 | 0.56 | 0.60 |
| 30 | (a) | — | — | 0 | — | — | — |
| | (b) | — | — | V.S.S. | V.S.S. | V.S.S. | V.S.S. |
| | (c) | — | — | — | — | 0.10 | 0.40 |
| | (d) | 0.31 | 0.32 | 0.34 | 0.36 | 0.38 | 0.40 |

Table 15.

Sterilization at 70°C

| Exposure Time minutes | Examined for | I Month | II Month | III Month | IV Month | V Month | VI Month |
|-----------------------|---|---------|----------|-----------|----------|---------|----------|
| 5 | (a) Observation | — | — | — | — | M.E. | M.E. |
| | (b) Taste (Original Sweet) | V.S.S. | V.S.S. | V.S.S. | S.S. | S.S. | S.S. |
| | (c) % increase in Alcohol (Over Original) | — | — | — | — | 0.10 | 0.10 |
| | (d) % increase in Acidity (Over Original) | 0.18 | 0.32 | 0.46 | 0.60 | 0.75 | 0.90 |
| 10 | (a) | — | — | — | — | M.E. | M.E. |
| | (b) | — | — | V.S.S. | V.S.S. | S.S. | S.S. |
| | (c) | — | — | — | — | — | — |
| | (d) | 0.16 | 0.26 | 0.38 | 0.50 | 0.62 | 0.74 |

| | | | | | | | |
|----|-----|------|------|--------|--------|--------|--------|
| 15 | (a) | — | — | — | — | — | M.E. |
| | (b) | — | — | V.S.S. | V.S.S. | V.S.S. | S.S. |
| | (c) | — | — | — | — | — | — |
| | (d) | 0.12 | 0.21 | 0.29 | 0.39 | 0.50 | 0.59 |
| 20 | (a) | — | — | — | — | — | M.E. |
| | (b) | — | — | — | V.S.S. | V.S.S. | S.S. |
| | (c) | — | — | — | — | — | — |
| | (d) | 0.10 | 0.15 | 0.20 | 0.27 | 0.35 | 0.43 |
| 25 | (a) | — | — | — | — | — | M.E. |
| | (b) | — | — | — | — | — | V.S.S. |
| | (c) | — | — | — | — | — | — |
| | (d) | 0.06 | 0.10 | 0.14 | 0.18 | 0.20 | 0.28 |
| 30 | (a) | — | — | — | — | — | M.E. |
| | (b) | — | — | — | — | — | V.S.S. |
| | (c) | — | — | — | — | — | — |
| | (d) | 0.02 | 0.04 | 0.05 | 0.05 | 0.10 | 0.12 |

Table 16. Sterilization at 80°C

| Exposure Time minutes | Examined for | I Month | II Month | III Month | IV Month | V Month | VI Month |
|-----------------------|---|---------|----------|-----------|----------|---------|----------|
| 5 | (a) Observation | — | — | — | — | — | — |
| | (b) Taste | — | — | — | — | — | — |
| | (Original Sweet) | — | — | V.S.S. | V.S.S. | V.S.S. | S.S. |
| | (c) % increase in Alcohol (Over Original) | — | — | — | — | — | — |
| | (d) % increase in Acidity (Over Original) | — | 0.02 | 0.02 | 0.04 | 0.04 | 0.06 |
| 10 | (a) | — | — | — | — | — | — |
| | (b) | — | — | V.S.S. | V.S.S. | V.S.S. | V.S.S. |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | 0.02 | 0.02 | 0.02 | 0.04 |
| 15 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | V.S.S. | S.S. |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | 0.02 |
| 20 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | — | — |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | — |
| 25 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | — | — |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | — |

| | | | | | | |
|-----|---|---|---|---|---|---|
| (c) | — | — | — | — | — | — |
| (d) | — | — | — | — | — | — |

Table 17. Sterilization at 90°C

| Exposure time Minutes | Examined for | I Month | II Month | III Month | IV Month | V Month | VI Month |
|--------------------------|---|------------|-------------|--------------|-------------|------------|-------------|
| 5 | (a) Observation | — | — | — | — | — | — |
| | (b) Taste (Original Sweet) | — | — | — | — | — | V.S.S. |
| | (c) % increase in Alcohol (Over Original) | — | — | — | — | — | — |
| | (d) % increase in Acidity (Over Original) | 0.01 | 0.02 | 0.02 | — | 0.02 | — |
| 10 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | — | — |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | — |
| 15 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | — | — |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | — |
| 20 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | — | — |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | — |
| 25 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | — | — |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | — |
| 30 | (a) | — | — | — | — | — | — |
| | (b) | — | — | — | — | — | — |
| | (c) | — | — | — | — | — | — |
| | (d) | — | — | — | — | — | — |

REPORT OF THE AGROSTOLOGY DIVISION (1974)

(A) General

During the year under review intercropping projects were started in the wet and intermediate rainfall zones to study the economics of intercropping coconuts with short term annual crops. In addition to these a number of agronomic studies were also commenced to study the feasibility and other agronomic requirements of these crops in the different rainfall zones. Rainfall at Bandirippuwa Estate during the year was rather poor being 29.49 cm (11.61 inches) below the average of 196.72 cm (77.45 inches) (10 year average) and this severely affected pasture production. Some of the pasture trials could not be carried to schedule due to the shortage of fertilizers that was experienced during the year.

(B) Pasture Studies

I. Experiment P 88 (B/E):- *Fodder Comparison Trial*

This experiment was set up to compare three fodder grasses for their productivity and effect on coconut at four levels of applied nitrogen. The design of the experiment is split plot with the fodder varieties in the main plots and the nitrogen levels in the sub plots with three replicates of all treatments.

Due to the non-availability of nitrogenous fertilizers during the year the fertilizer treatments could not be imposed. However two samplings were taken during the two growing seasons to compare the yields and crude protein contents of the three fodder grasses at that level of soil fertility. These are given in Table 1.

Table 1. *Herbage dry matter yield and crude protein percentage (mean yields of 3 replicates)*

| <i>Fodder variety</i> | | <i>Dry matter yield (kg/ha)</i> | <i>Crude protein (percent)</i> |
|-----------------------|-------|-------------------------------------|------------------------------------|
| Pusa Giant Napier | .. .. | 764.6 | 8.64 |
| Guinea B | .. .. | 960.6 | 7.24 |
| Setaria sphacelata | .. .. | 1150.3 | 7.75 |

The data shows that kazungula Setaria and Guinea B are superior to Pusa Giant Napier at low levels of soil fertility.

2. Experiment P91 (R/E)

This experiment was set up to compare the productivity and crude protein content of three fodder grasses due to two intensities 15.24 cm and 30.48 cm (6" and 12") above ground level and two frequencies of cutting (30 and 60 day intervals). Two sampling cycles were completed during the year and the dry matter yields and the crude protein contents are given in Table 2 and Table 3 respectively.

Table 2. *Herbage dry matter yields (kg/ha) (mean of five replicates)*

| Variety | I ₁ | | I ₂ | | I ₃ | | F ₁ | | F ₂ | | Grand Total |
|--------------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|-------|----------------|--|-------------|
| | F ₁ | F ₂ | Total | F ₁ | F ₂ | Total | Total | Total | Total | | |
| Pusa Giant Napier | 652 | 4374 | 5026 | 934 | 5007 | 5941 | 1586 | 9381 | 10967 | | |
| Panicum maximum | 1499 | 7123 | 8622 | 2069 | 7287 | 9356 | 3586 | 14410 | 17978 | | |
| Setaria sphacelata | 783 | 6370 | 7153 | 1163 | 5785 | 6948 | 1946 | 12155 | 14101 | | |

Table 3. *Crude protein content (per cent) (mean of five replicates)*

| Variety | I ₁ | | I ₂ | | I ₃ | | F ₁ | | F ₂ | |
|--------------------|----------------|----------------|----------------|----------------|----------------|------|----------------|------|----------------|--|
| | F ₁ | F ₂ | Mean | F ₁ | F ₂ | Mean | Mean | Mean | Mean | |
| Pusa Giant Napier | 10.77 | 7.94 | 9.36 | 14.00 | 8.36 | 9.68 | 10.07 | 8.15 | | |
| Panicum maximum | 8.76 | 6.46 | 7.62 | 7.86 | 6.65 | 7.26 | 8.31 | 6.56 | | |
| Setaria sphacelata | 10.12 | 7.32 | 8.72 | 9.90 | 9.06 | 9.48 | 10.01 | 8.19 | | |

The data indicate that Guinea B is superior to Pusa Giant Napier in dry matter production at both intensities and frequencies of defoliation. However in the crude protein contents both Pusa Giant Napier and Setaria appear to have an edge over Guinea B.

3. Experiment P 5 (R/E)

Levels of manuring and grazing on Coconut/Brachiaria miliiformis association.

Pasture was not sampled during the year due to a break-down of the forced air oven. Grazing was however done to schedule and the nut yields due to the different treatments are given in Table 4.

Table 4. *Nut yields due to different treatments in experiment P5*

| Treatment | Nut yield (No. of nuts/ha) |
|------------------------|----------------------------|
| Estate control (weeds) | FNGO 11465 |
| Brachiaria miliiformis | FNGO 7383 |
| " " | FNGN 9963 |
| " " | FNGH 7472 |
| " " | FHGN 9337 |
| " " | FHGH 10685 |

F=Fertilizer: G = Grazing: 0 = Nil: N = Normal: H = Heavy

The data show that the replacement of the weed cover with a productive pasture brings down the yield of coconut but this is corrected when the fertilizer level is increased and the pasture grazed at a higher intensity. The pattern of response is similar to that reported in the previous year.

4. Experiment P21 (R/E)

Levels of fertilizer on a coconut/Brachiaria miliiformis association

Due to the break-down of the pasture-drying equipment the pasture was not sampled to determine dry matter production during the year. However the grazing was done to schedule. The nut yield data are presented in Table 5.

Table 5. *Nut yields due to different treatments in experiment P 21*
(Mean of four replicates)

| Treatment | Nut yield (No. of nuts/ha) |
|--|----------------------------|
| N ₂ P ₁ K ₁ | 9963 |
| N ₂ P ₁ K ₂ | 8593 |
| N ₄ P ₁ K ₁ | 8210 |
| N ₄ P ₁ K ₂ | 7374 |
| N ₂ P ₂ K ₁ | 9101 |
| N ₂ P ₂ K ₂ | 9924 |
| N ₄ P ₂ K ₁ | 9015 |
| N ₄ P ₂ K ₂ | 9337 |

The data show that at the higher level of nitrogen applied there had been a drop in the yield of coconuts.

5. Experiment P22 (R/E)

Levels of fertilizer and type of management on performance of a Coconut/Brachiaria miliiformis association

The experiment was managed to schedule during the year. The nut yield data are given in Table 6.

Table 6. *Nut yields due to different treatments in experiment P 22*

| Treatment | Nut yield (No. of Nuts/ha) |
|---------------------------------------|----------------------------|
| 1/2 Normal fertilizer - pasture mowed | 6018 |
| 1 " " " " | 7739 |
| 2 " " " " | 7152 |
| 4 " " " " | 8900 |
| 1/2 " " pasture grazed | 6694 |
| 1 " " " " | 7820 |
| 2 " " " " | 7380 |
| 4 " " " " | 6092 |

Data indicate that there is a progressive increase in the nut yields with increase in the level of fertilizer added. There does not appear to be any significant difference in the nut yields due to the type of management of the pasture.

(C) Intercropping Projects

1. Koodaluagara Project, Mulleriyawa

The objectives of this experiment are (i) to study the comparative advantage of intercropping lands under ordinary coconut and king coconut, spaced at 12.80 m (42 ft) by 6.10 m (20 ft), (ii) to evolve a suitable system of intercropping in a new plantation wherein a semi-perennial (plantain), a long term annual (manioc) and a short term annual (chilli) are combined, (iii) to ascertain the economic feasibility of intercropping in a new plantation, spaced at 12.80 m (42 ft) by 6.10 m (20 ft), after providing optimum inputs, (iv) to determine within which period of time the capital expenditure on establishing coconut on a newly planted land can be recovered by intercropping during the pre-yielding period of the palm and (v) to ascertain how successfully intercropping could be continued after the palms come into bearing, ie, when their canopies begin to cut off the sunlight.

Intercropping trials in this Project commenced in June, 1974. The existing stand of young palms were planted on the avenue system with a spacing of 12.80 m (42 ft) by 6.10 m (20 ft) in a new clearing with an undulating terrain. A four wheel tractor was used to level the land and construct terraces and ridges. The land was cleared with use of manual labour. The following categories of crops were established in this 1.8225 ha (4½ acre) block of land. Records of all agricultural operations, input/output data in respect of each crop and all other information required for an accurate assessment were maintained.

During Yala 1974, the following crops were grown: Manioc, colocasia, Lanka parippu, chilli, bandakka and plantain. During Maha, 1974 a few vegetable crops like raddish, capsicum, brinjal were added. In this project Lanka parippu did not perform too well, but the chilli, manioc and plantain did very well. Water for supplementary irrigation is provided by a well within the project. The construction of a store and office is nearing completion.

The officer in charge of the project is a Field Assistant and his work is being supervised by the Experimental Officer (wet zone area). The work in this project is satisfactory.

2. St. Peter's Project, Ingiriya

The objectives of this experiment are (i) to demonstrate the economic feasibility of intercropping in a mature stand of coconut planted on the traditional square system of 7.92 m (26 ft) by 7.92 m (26 ft) spacing (ii) to assess the suitability and performance of intercrops under wet zone conditions and (iii) to evaluate the income per hectare of mature coconut lands intercropped with a range of intercrops. This experiment is statistically designed and will follow a fair assessment of the economics of intercropping.

St. Peter's Project is situated in the low country wet zone, about 64.35 km (40 miles) from Colombo, receiving an average of 304.8 cm (120 inches) of rain annually, which is well distributed without any distinct dry period. The terrain is both sloping steeply and undulating. As a result close soil and water conservation measures had to be adopted by constructing contour terraces, bunds and drains. The soil is of the coarse sandy clay loam type with gravel incorporated in it and is acidic. The incorporation of organic fertilizer before the establishment of crops has proved to be very useful especially in view of the high rainfall coupled with erosion. The existing mature stand of coconut is over 60 years old, planted on the square system spaced at 7.92 m (26 ft) X 7.92 m (26 ft).

Due to the nature of the terrain quite some time had to be devoted on contour ridging and terracing of the land. The trials in this project commenced in April, 1974. The following categories of crops were established and records of all agricultural operations, input/output data in respect of each crop were maintained.

| Crop | | | Yala 1974 | Maha 1974 |
|---------------|-----------------|----|-----------|-----------|
| Manioc | Coconut squares | .. | 75 | — |
| Colocasia | " " | .. | 28 | 19 |
| Passion Fruit | " " | .. | 78 | — |
| Plantain | " " | .. | 46 | 97 |
| Papaw | " " | .. | 26 | — |
| Sweet potato | " " | .. | — | 45 |
| Lanka Parippu | " " | .. | — | 40 |
| Sorghum | " " | .. | — | 15 |

In this project it has been found that cereals and pulses do not do well while the root crops grow very satisfactorily. Of the root crops manioc, colocasia and turmeric appear to be promising. Passion fruit and plantain do equally well.

3. Delgolla Project, Kirimetiya

This project coming within the Intermediate zone is situated in the village of Kirimetiya, 6.43 km (4 miles) away from Coconut Research Institute and receives an annual rainfall of around 190.50 cm (75 inches). The objectives of this experiment are (i) to demonstrate the economic feasibility of diversifying monocropped coconut land with other crops and (ii) to maximise the income per hectare of coconut land through intercropping.

The participants in this project, 20 in number, have been selected from the village of Kirimetiya. There are 14 girls and 6 men in the youth organisation which handles this project.

Work on this project started in May, 1974. With the assistance of youth the preliminary land preparation was accomplished. 6.075 hectares (15 acres) were cleared and prepared for the Yala cultivation. Lanka Parippu, in particular, did very well during this season. The Soya bean also yielded good results. But in the Maha of 1974 there was a failure of crops, other than manioc, due to the severe drought. It was therefore clear that without supplementary irrigation it was a risk to plant annual crops on this land. Accordingly funds were provided for sinking two wells in this project.

In spite of crop failure the total income up to December, 1974 was Rs. 5,604.39. The capital expenditure was Rs. 15,035.47 which included several items of capital expenditure.

(D) Agronomic Studies of Intercrops

1. Experiment S2 (B/E)

To study the effects of Nitrogen fertilization and spacing on the growth and yield of manioc under coconut.

The experiment which commenced in May, 1973 and was concluded in March, 1974 had the following treatments:

Levels of Nitrogen

| | | |
|----------------|---|-------------------------------|
| N ₁ | — | 44.87 kg N/ha (40 lbs N/acre) |
| N ₂ | — | 67.30 kg N/ha (60 lbs N/acre) |
| N ₃ | — | 89.74 kg N/ha (80 lbs N/acre) |

Spacing

| | | |
|----------------|---|--------------------------------|
| S ₁ | — | 91.44 cm X 60.96 cm (3' X 2') |
| S ₂ | — | 91.44 cm X 91.44 cm (3' X 3') |
| S ₃ | — | 91.44 cm X 121.92 cm (3' X 4') |
| S ₄ | — | 91.44 cm X 152.40 cm (3' X 5') |

The design was a randomized block design with three replicates of all treatments. The yield of tubers is given in Table 7.

Table 7. Tuber yields in Kg/ha

| | | | | N ₁ | N ₂ | N ₃ | Total |
|----------------|----|----|----|----------------|----------------|----------------|---------|
| S ₁ | .. | .. | .. | 32,554 | 62,847 | 38,884 | 134,285 |
| S ₂ | .. | .. | .. | 24,425 | 23,521 | 30,456 | 78,402 |
| S ₃ | .. | .. | .. | 16,729 | 21,476 | 23,737 | 61,942 |
| S ₄ | .. | .. | .. | 15,735 | 15,192 | 15,372 | 46,299 |
| Total | .. | .. | .. | 89,443 | 123,036 | 108,449 | 320,928 |

At all levels of nitrogen the highest yields were obtained at the highest density. Except at the highest density there was a progressive increase in yield with the increase in the level of nitrogen. However at the highest density the highest yield was obtained at the medium level of nitrogen application. The depression in tuber yield at the highest level of nitrogen application when planted close may be due to competition for light between individual plants.

2. Experiment S₃ (R/E)

To study the effects of nitrogen fertilization and plant density on the growth and yield of Soya bean variety.

Bragg :

The experiment which commenced in November, 1973 was completed in January, 1974. The treatments were as follows:

Levels of N

| | | |
|----------------|---|-------------------------------|
| No | — | No fertilization |
| N ₁ | — | 11.22 kg N/ha (10 lbs N/acre) |
| N ₂ | — | 22.44 kg N/ha (20 lbs N/acre) |
| N ₃ | — | 33.66 kg N/ha (30 lbs N/acre) |
| N ₄ | — | 44.87 kg N/ha (40 lbs N/acre) |

Row Spacing

| | | | |
|----------------|---|----------------------|--------------|
| S ₁ | — | 38.10 cm (15 inches) | between rows |
| S ₂ | — | 45.72 cm (18 inches) | ” ” |
| S ₃ | — | 53.34 cm (21 inches) | ” ” |
| S ₄ | — | 60.96 cm (24 inches) | ” ” |

The design was split plot with three replicates of all treatments. The seed yield due to levels of N and row spacing are given in Table 8.

Table 8. Yield of Soya bean (kg/ha)

| Levels of N | | Seed Yield | Levels of Spacing | Seed yield |
|----------------|----|------------|-------------------|------------|
| No | .. | .. 382.7 | S ₁ | 430.1 |
| N ₁ | .. | .. 385.2 | S ₂ | 428.0 |
| N ₂ | .. | .. 381.6 | S ₃ | 387.5 |
| N ₃ | .. | .. 449.6 | S ₄ | 330.0 |
| N ₄ | .. | .. 369.5 | | |

There was no significant difference in yields due to levels of applied N but there was a significant decrease in yield as the distances between rows increased. The highest seed yields were recorded when the distance between rows was 38.10 cm – 45.72 cm (15 – 18 inches).

3. Experiment S₄ (R/E), International Soya Bean varietal testing trial.

Twenty varieties of Soya bean were tested in a randomised block design with four replicates. The seed yields and the other important observations taken are given in Table 9.

Table 9.

| | <i>Variety</i> | <i>Yield kg/ha</i> | <i>Days to Flower</i> | <i>Days to Maturity</i> |
|-----|---------------------|------------------------|---------------------------|-----------------------------|
| 1. | Hardee .. | 524.3 | 31.8 | 77.3 |
| 2. | Hampton .. | 502.2 | 27.8 | 72.0 |
| 3. | Pb - 1 .. | 496.8 | 32.3 | 69.3 |
| 4. | Williams .. | 474.7 | 32.0 | 71.3 |
| 5. | Adelphia .. | 474.3 | 28.0 | 71.0 |
| 6. | Improved Pelican .. | 464.0 | 34.3 | 72.0 |
| 7. | Clare 63 .. | 460.9 | 27.5 | 70.0 |
| 8. | Harosoy 63 .. | 456.8 | 25.8 | 64.0 |
| 9. | Semmes .. | 452.6 | 27.5 | 70.5 |
| 10. | Pickett 71 .. | 452.2 | 27.8 | 70.0 |
| 11. | Davis .. | 435.9 | 30.5 | 74.3 |
| 12. | SJ - 2 .. | 431.8 | 36.0 | 77.0 |
| 13. | Lee - 68 .. | 430.1 | 27.8 | 69.8 |
| 14. | Calland .. | 420.5 | 28.5 | 70.8 |
| 15. | Hutton .. | 378.0 | 27.8 | 70.8 |
| 16. | Bragg .. | 320.9 | 26.8 | 70.5 |
| 17. | Hark .. | 296.7 | 26.8 | 66.0 |
| 18. | Jupiter .. | 257.6 | 40.0 | 94.0 |
| 19. | Tainuner .. | 255.5 | 32.8 | 71.3 |
| 20. | TK - 5 .. | 254.2 | 33.8 | 71.3 |

Almost all the varieties tested recorded very poor seed yields. This may be due to the rather poor rainfall received during the period.

4. Experiment S₅ (B/E), International Soyabean varietal trial

Fifteen varieties of Soya bean were tested in the Yala under rainfed conditions for their seed yields and other agronomic characters. The data collected is given in Table 10.

| | <i>Variety</i> | <i>Yield kg/ha</i> | <i>Days to Flower</i> | <i>Days to Maturity</i> |
|-----|---------------------|------------------------|---------------------------|-----------------------------|
| 1. | Jupiter .. | 115.2 | 46 | 139 |
| 2. | Hampton 266A .. | 473.7 | 20 | 98 |
| 3. | Hardee .. | 287.5 | 33 | 98 |
| 4. | Improved Pelican .. | 104.2 | 37 | 114 |
| 5. | Bossier .. | 186.2 | 38 | 105 |
| 6. | Bragg .. | 271.1 | 30 | 95 |
| 7. | Davis .. | 324.7 | 30 | 92 |
| 8. | Tracy .. | 391.8 | 27 | 93 |
| 9. | Forrest .. | 341.1 | 29 | 84 |
| 10. | Hill .. | 402.2 | 30 | 82 |
| 11. | Clare 63 .. | 324.7 | 34 | 90 |
| 12. | Bonus .. | 481.2 | 28 | 87 |
| 13. | Williams .. | 373.9 | 25 | 84 |
| 14. | Pb - 1 .. | 235.4 | 35 | 97 |
| 15. | SJ - 2 .. | 119.2 | 36 | 103 |

Under rainfed conditions in the Yala almost all the varieties recorded very poor yields.

5. Experiment S₆ (R/E)

Fifteen varieties of Soya bean were tested in the Yala with supplementary irrigation whenever the plants showed signs of moisture stress. The yield data collected are shown in Table 11.

| Table 11. | Variety | | Yield kg/ha | Days to Flower | Days to Maturity |
|-----------|---------------------|----|----------------|-------------------|---------------------|
| | 1. Jupiter | .. | 339.0 | 42 | 141 |
| | 2. Hampton 266A | .. | 1294.5 | 29 | 105 |
| | 3. Hardee .. | .. | 1321.0 | 86 | 112 |
| | 4. Improved Pelican | .. | 995.1 | 36 | 120 |
| | 5. Bossier .. | .. | 719.5 | 38 | 124 |
| | 6. Bragg .. | .. | 1077.0 | 30 | 113 |
| | 7. Davis .. | .. | 1291.5 | 29 | 110 |
| | 8. Tracy .. | .. | 945.9 | 30 | 95 |
| | 9. Forrest .. | .. | 1278.1 | 30 | 96 |
| | 10. Hill .. | .. | 850.6 | 32 | 86 |
| | 11. Clark 63 | .. | 874.4 | 29 | 92 |
| | 12. Bonus .. | .. | 705.8 | 30 | 105 |
| | 13. Williams | .. | 944.4 | 28 | 103 |
| | 14. Pb - 1 .. | .. | 1208.1 | 38 | 100 |
| | 15. SJ - 2 .. | .. | 499.9 | 38 | 112 |

Data indicate that some of the varieties tested are capable of producing satisfactory yields when supplementary irrigation is provided.

(E) Cattle

The rotational cross breeding programme was continued. There were fifty Sinhala x Jersey cows and Forty Sinhala x Jersey x Sindhi heifer calves belonging to the programme at the end of the year. Four of the Sinhala x Jersey x Sindhi animals mated to Freisian have produced two heifer calves during the year.

A total quantity of 1,141,79 pints of milk was produced during the year. The average milk production of the Jersey x Sinhala was 8 pints / day while that of the Sinhala was only 4 pints per day.

During the year the animals were vaccinated for BQ, HS and Foot and Mouth. There were 69 births and 16 deaths during the year. Of these 8 were due to BQ.

There was a sale of 113 animals during the year.

The herd strength at the end of the year was as follows:

| | | | Bulls | Cows | Heifer calves | Bull calves | Total |
|----------|----|---|-------|------|---------------|-------------|-------|
| B/E .. | .. | 2 | 51 | 161 | 8 | 222 | |
| R/E .. | .. | 2 | 79 | 30 | 22 | 133 | |
| Total .. | .. | 4 | 130 | 191 | 30 | 355 | |

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

REPORT OF THE CROP PROTECTION DIVISION (1974)

Biological control of the pests *Nephantis serinopa* and *Aspidiotus destructor* and the weed, *Eupatorium odoratum* received considerable attention during the year under review. Research on the diseases, Leaf Scorch Decline, Bud Rot and Bole Rot by *Ganoderma boninense* was also carried out. There were no major outbreaks of pests or diseases during the year under review.

PESTS

Coconut Caterpillar, *Nephantis serinopa* Meyr. (Cryptophasidae). The incidence of this pest in the North Western Province, Western Province and Southern Province was very low and that in the Eastern Province, comparatively lower than in the previous year. The parasites of this pest were bred in the laboratories at Lunuwila and Mylambavely and released throughout the year in the pest infested areas.

Spoggosia bezziana Bar. (Tachinidae), *Eriborus trochanteratus* Morley (Ichneumonidae) and *Trichogramma braziliensis* (Trichogrammatidae) were mass bred in the Parasite Breeding Station at Mylambavely. In addition to the above, *Perisierola nephantidis* Gah. (Bethyilidae) was mass bred in the insectary at Lunuwila. *Elasmus nephantidis* Roh. (Elasmidae) was bred and released for a short period. The culture was lost in the laboratory due to difficulties in getting a regular supply of the pre-pupae of *Nephantis serinopa*. Laboratory cultures of the parasites, *Trichospilus pupivora* F, *Tetrastichus israeli* M & K and *Brachymeria nephantidis* Gah. were maintained throughout the year. Populations of the pest and its parasites in the pest infested areas were regularly assessed. Most of the parasites were released personally by the staff of this division. The rest were sent by post to the pest infested areas.

Eastern Province

The pest infestation was found in fifteen estates. The pest was brought under control in many of them. The outbreaks of this caterpillar attack in Pottuvil and Pasikudah were brought under complete control by release of parasites. At Akkaraipattu the pest population was very much lower than in the past.

Trichospilus pupivora was recovered from the pest pupae collected from coconut and palmyrah palms at Mawadipalli in the Eastern Province surrounded by paddy fields. *Spoggosia bezziana* was also recovered from the pest infested Palmyrah palms in the same estate.

Several pupae of the pest in groups were found in the splits on the palm trunk, between leaf bases and trunk, in the stipules, bracts and spathe of the Coconut inflorescence at Saukady, Mawadipalli, Pottuvil and Thirukkivil during the early part of January. Usually solitary pupae of the pest are very commonly found in the larval galleries in coconut leaflets in all the pest infested areas. Such aggregations of pupae were not encountered anywhere during the hotter and drier months of the year. In some estates where the pest was brought under complete control recurrent attacks occur after a long duration. Further studies have to be carried out on this aspect to find the reason for such recurrence.

Among the aggregations of pupae a few parasitised by *Trichospilus pupivora* were observed. Even though *Spoggosia bezziana* was recovered from the estates wherever the pest attack was found this parasite has not brought the pest under control satisfactorily. The puparia of this parasite were attacked by hyperparasites including *Trichospilus pupivora* in the Eastern Province.

Trichogramma braziliensis was released in bulk in many estates. This parasite was recovered from the release points in the field. This might have contributed partly to bringing down the pest population in many estates.

North Western Province

The pest attack was severe in one estate until the third quarter of the year. By continuous releases of parasites including *Trichogramma braziliensis* the pest was brought under complete control.

Western and Southern Provinces

Only a very few reports of the pest attack were received during the year under review. The pest was brought under control by releasing parasites. From one estate in the Western province *Trichospilus pupivora* was recovered from the pest pupae in large numbers.

In a preliminary trial carried out in the laboratory at Lunuwila three formulations of viable spores of the entomogenous pathogen, *Bacillus thuringiensis* Berliner (Crystal bearers), were sprayed on coconut leaflets and fed to the caterpillars of *Nephantis serinopa*. The results were promising. The formulations were Dipel, Thuricide, and Biotrol. In 1975 it is proposed to carry out further trials along those lines.

Field releases of parasites of *Nephantis serinopa* for 1974.

| Parasites | E. P. | W.P. | S.P. | N.W.P. | Total |
|--|-----------|----------|----------|--------|-----------|
| <i>Perisierola nephantidis</i> Mus .. | 96,040 | 8,900 | 9,360 | 6920 | 1,21,220 |
| <i>Spoggosia bezziana</i> Baranoff. .. | 17,390 | 1,807 | — | 200 | 19,397 |
| <i>Eriborus trochanteratus</i> Morley .. | 15,944 | 1,922 | — | 500 | 18,366 |
| <i>Trichogramma braziliensis</i> .. | 32,60,800 | 7,80,400 | 1,16,800 | 84,000 | 42,42,000 |
| <i>Trichospilus pupivora</i> Ferriere .. | 4,000 | — | — | — | 4,000 |
| <i>Elasmus nephantidis</i> Rhower .. | 325 | — | — | — | 325 |
| Total .. | 33,94,499 | 7,93,029 | 1,26,160 | 91,620 | 44,05,308 |

The Coconut Leaf Miner, *Promecothea cumingi* Baly. (Hispididae)

The work in connection with the control of this pest was handled by the Biological Control Laboratory in Colombo. The areas where the pest infestations occurred in the past were regularly inspected. The observations revealed that the pest was very much under control. However, very few adults and parasitised and unparasitised larval mines of the pest were found in some areas. The parasites, *Dimmockia javanica* and *Pediobius parvulus* were recovered from the areas where observation surveys for the pest incidence were carried out. These have established well in the field. Breeding of the parasites in the laboratory was stopped due to the non-availability of a regular supply of the host (pest) material. The parasites recovered from the field were re-distributed in the areas where the pest was found.

The Coconut Scale pest, *Aspidiotus destructor* Sign. (Diaspididae)

Twelve new reports of the pest infestations were received during the year. Our observations however revealed that there were more infestations during the year than in the previous year. In a few estates the attack was found to be severe. Unusually prolonged drought which prevailed during the year was the major factor for the higher incidence of the scale pest attack.

Even though there are several indigenous coccinellid predators of this pest in Sri Lanka, these failed to control the pest in time so as to prevent the pest attack in the form of an outbreak in a few estates. Therefore, exotic predatory Coccinellid beetles viz. *Cryptognatha nodiceps*, *Azya trinitatis*, *Lindorus lophanthae* and *Nephus aemeipennis* were imported from the

West Indian Station of the Commonwealth Institute of Biological Control at Trinidad. The first consignment of these predators was received on 1974.01.18. They were all dead when received. The second consignment which was received on 1974.02.04 consisted of *Cryptognatha nodiceps* and *Azya trinitatis*. The third consignment which was received on 1974.02.08 consisted of the latter two predators in addition to *Lindorus lophanthae* Blaisd. The last two consignments consisted of live insects. The laboratory culture of *Azya trinitatis* was lost after a few months as they did not multiply in the laboratory on caged Scale-infested pumpkins supplied under normal temperature conditions.

Cryptognatha nodiceps Mshl. This exotic predator was mass bred in the laboratory at Lunuwila on Scale-infested pumpkin fruits. A total of 11,608 adults were released in eleven estates in the North Western Province, Central Province and in the Southern Province. Regular observations were taken for the field recovery of this predator from all the release points. No recoveries were made from the release points until the end of the year. This predator has not established in the field. However, as it was possible to mass breed this insect in the laboratory under normal temperature conditions at Lunuwila the chances for the predator to get established in the field cannot be completely ruled out. It is too early yet to arrive at any conclusion.

Lindorus lophanthae Blaisd. This exotic predator was bred in the Biological Control Laboratory at Colombo on Scale-infested pumpkin fruits. A total of 3432 of this were released in the scale-infested areas. This predator was recovered from two release points.

In a few estates where severe scale attack was found, the larvae of the indigenous coccinellid predator, *Chilocorus nigritus* were found feeding on the pest. However it has been observed that this predator bred very quickly and brought the pest under control in the estates where chemical control was not adopted. The parasite *Aphytis sp.* was also found in some estates bringing the pest under control. A preliminary trial was carried out to study the effect of spraying kerosene oil soap emulsion on larvae and adults of a few coccinellid predators of Coconut Scale. The results of this trial will be published later.

The Black Beetle pest, *Oryctes rhinoceros* L (Scarabeidae)

Thirty-three new reports of this pest attack were received during the year. Chemical and cultural control methods were recommended. A small laboratory culture of the exotic predator, *Platymeris laevicollis* Dist. (Reduviidae) which was introduced from Western Samoa in the past was maintained throughout the year. As this predator has a wide range of hosts we do not expect this predator to bring the black beetle pest under control in the field.

Liberation of a virus, *Rhabdionvirus oryctes* in black beetle infested islands in the Pacific has nearly always had very beneficial results. This virus was very successful when it was introduced into Mauritius. When consulted, Dr. George O. Stride, Project Manager of the U.N./S.P.C. Rhinoceros Beetle Project, Apia, Western Samoa, has written to us that the virus cannot be distributed from there until it has been safely tested to show it is harmless to human beings. Attempts will be made to introduce a more virulent strain of *Metarrhizium anisopliae* a fungus which causes a fatal disease to the larvae of the pest.

The Red Weevil Pest, *Rhynchophorus ferrugineus* F. (Curculionidae)

Fifty-five reports of attack by this pest were received during the year. Tests for the efficacy of the red weevil trap were continued during the year with the following results:

| Location | No. of traps used. | No. of weevils caught. |
|----------|--------------------|------------------------|
| 1 | 20 | 1231 in 12 months |
| 2 | 16 | 308 in 6 months |
| 3 | 8 | 299 in 12 months |

In many places where this pest damage was found the owners of the estates had not taken necessary precautions. The injection of the systemic insecticides will be useful to save the palm only if carried out in the early stages of the pest infestation.

Nettle grub pest, *Parasa lepida* Cram. (Limacodidae).

Only two incidences were reported, both from the Puttalam district. In one estate insecticide spraying was carried out. However, there were repeated attacks in this estate. In the other estate the pest attack was not severe as there was partial control by natural enemies and thus chemicals were not sprayed. The nettle grubs were fatally attacked by the predatory bug *Platymeris laevicollis* when supplied in the breeding cage in the laboratory.

Xyleborus similis Ferr. Incidence of this pest attack was found only in the Northern Province in one estate. The attack was on the decline during the middle of the year but it seemed to have increased towards the end of the year. Chemical control was recommended.

Diocalandra frumenti F. Only one incidence of the attack was reported. Chemical control was recommended.

Mealy bugs, *Dysmicoccus* sp.

Several palms in one estate in the Puttalam district had this insect in large numbers on the inflorescences. Live forms were seen on freshly harvested spikes in the pedicels as well as in the calyx. Groups of these insects in small numbers were seen in coconut leaflets infested by the Coconut Scale pest in many estates in the North Western Province and in the Western Province. Small black ants were found in association with these insects. A sample of these mealy bugs sent to the British Museum of the Commonwealth Institute of Entomology, London has been identified as *Dysmicoccus* sp. by Dr. D. J. Williams. According to him this species has been received in recent years from a few South East Asian countries. It is proposed to further study the damage caused by this pest.

The Yellow Spotted Locust, *Aularches miliaris*

Three reports of new incidences were received. The pest was brought under control by spraying insecticides.

DISEASES OF COCONUT

Basal Stem Rot by *Ganoderma boninense* Pat.

In the Southern Province in one estate 81 coconut palms have died so far due to infection by this fungus. The infected palms show yellowing and drying up and drooping of the lowest fronds in the crown. The fronds gradually become smaller and are usually few in number. The nuts are usually abnormally narrow and in some nuts a constriction close to the pedicel end of the nut gives the appearance of a distinct neck. In the final stages of the disease the crown is markedly reduced in size and is often blown over. The stem near the soil surface is often characterised by the appearance of a reddish brown discolouration with an exudation of a gummy substance. The typical bracket shaped fructifications appear at this region. These sporophores are white, button-shaped initially but rapidly change into the characteristic flat bracket shape. Their upper sides then become dark brown, uneven, loosely zoned with a white margin. The underside is white with myriads of tiny pores which shed large numbers of chocolate brown spores. Often large numbers of sporophores are formed in an overlapping series. The base of the trunk of the palm when cut open shows large patches of dark brown tissue. A decay of extensive areas of the stem near the soil surface occurs due to the invasion by the fungus and as a result extensive cavities are formed. The diseased roots are often friable and the cortex is light brown. White fungal mats are sometimes seen when the roots are teased open.

The infected trees are usually confined to groups. The infection was observed in palms which are more than 40 to 50 years old and there was no evidence of the appearance of the disease in young palms. The stumps of the palms may be infected by airborne spores. Living palms may be mostly infected by root contact with infected material. Senescence of the palms apparently lowers their resistance to disease. It is possible that young palms too can become infected in thinned plantations where virtually every stump becomes infected and the inoculum potential is high. Once the infection has been diagnosed with certainty then the palms have to be destroyed. To obtain a disease-free stand all the stumps have to be uprooted and burnt at the time of replanting as the infected bole of the palm can be an important source of infection.

Bud Rot by *Phytophthora palmivora*

Twelve incidences were reported during the year. There was no outbreak in any of these estates. A trial to study the effect of placing fungicidal soap cubes in the crowns of healthy palms surrounding the affected palms as a prophylactic measure was carried out in one estate in the Southern Province. There was no incidence of the disease in the treated palms.

Stem bleeding by *Ceratocystis paradoxa*

Nine incidences were reported. Necessary control measures were recommended. There was no outbreak of this disease during the year.

Leaf Blight by *Helminthosporium incurvatum* and *Pestalotiopsis palmarum*.

Twenty new incidences were reported. Necessary recommendations were given. There was no outbreak of the disease during the current year.

Leaf Scorch Decline

(a) The field trials which were started earlier with regard to soil improvement by drainage were continued. Observations from Kirimetiya Estate, Elipitiya and Rathmehera Estate, Gonapinuwala were recorded throughout the year.

(b) An attempt was made to control the disease by injection of the chemical Wiltrol C. 120 into the palm trunks in the form of a preliminary trial at Bandirippuwa Estate. This was started in September 1974. The chemical was obtained from Kerala, India and the formulation is supposed to contain mainly a complex soluble salt of the rare earth, Zirconium in Ammoniacal solution in combination with elements such as Copper, Magnesium, Zinc etc. together with Triethanolamine. Regular observations were being taken and if promising results are obtained it is proposed to conduct trials on a large scale in 1975.

BIOLOGICAL CONTROL OF *Eupatorium odoratum*,

The exotic beneficial leaf eating insect *Ammalo insulata* which was introduced into Sri Lanka in December 1973 for the control of the weed *Eupatorium odoratum* was mass bred throughout the year in the laboratories at Lunuwila and Colombo and released in the estates where this weed was found. This insect has multiplied in several thousands in an estate at Bandirippuwa near the head office of the Institute. Its larvae have completely defoliated the bushes leaving only the hard stem. Even the tender vegetative buds were eaten by the larvae. From this estate several thousands of larvae were collected by the staff of this division and released in estates where large extents of this weed were found. Before the end of the year intensive defoliation of the bushes was observed in four other estates close to the institute. In one estate at Haldanduwana it took only two months for intensive defoliation to occur after the first release was made. At Bandirippuwa where first intensive defoliation occurred in July, the bushes in about five acres were found dead at the end of the year due to repeated defoliation. In an adjoining land the bushes died a few months after intensive defoliation as this was followed by severe drought.

All the plants except the weed *Ageratum conyzoides* which were found in association with *E. odoratum* were left unattacked by this insect even where complete defoliation of the latter weed occurred. From there the larvae were moving far in search of the weed *E. odoratum* leaving the other plants unattacked. The weed *Ageratum conyzoides* was found severely defoliated in the field by the larvae of this insect. Preliminary studies in the laboratory revealed that *Ammalo insulata* can complete its life cycle when fed alone with the leaves of *A. conyzoides*.

Large scale multiplication of this insect was found to occur mostly in the fields where the weeds were succulent. In dry areas the results were not as promising.

Tetrastichus israeli and *Trichospilus pupivora* were found to parasitise the pupae of *Ammalo insulata* in the laboratory. These parasites were released in the past in estates for the control of the Coconut Caterpillar pest. *T. pupivora* is an indigenous parasite and is recoverable from the field. In addition a second instar larva of *A. insulata* with the grubs of a Braconid parasite was collected from the field at Bandirippuwa. The adults of this parasite will be sent for identification in the near future. In the long run these parasites may be harmful for the large scale multiplication of *A. insulata* in the field.

Apion brunneonigrum. This exotic beneficial weevil was introduced from the Commonwealth Institute of Biological Control, Trinidad in February, 1974 and released on the bushes of *E. odoratum* in the flowering stage at Kallady in the Puttalam District. They have not established in the field. We propose to get down another consignment of this insect in 1975. These insects control the weed by the destruction of its flowers.

MISCELLANEOUS

The Biological Control laboratory in Colombo continued to function well in 1974.

The Parasite Breeding Station at Mylambavelly was provided with air-conditioning facilities. The insectary at Lunuwila was provided with additional air-conditioning facilities.

PERSONNEL

Mr. R. Mahindapala, Research Assistant, successfully completed the Masters degree in Plant Pathology.

Mr. B. H. Rohitha, Research Assistant, left for New Zealand in February 1974 on a Commonwealth Scholarship to do Post-graduate studies in Entomology. Since then Mr. P. Kanagaratnam, Research Assistant, took charge of the Division.

Messrs M. S. Velu, Technical Assistant and J.L.J.G. Pinto, Senior Field Assistant, underwent training in biological control at the Commonwealth Institute of Biological Control, Bangalore, India on a three-month fellowship provided by the FAO.

Dr. P. R. Dharmadhikari, the FAO Expert, continued to guide the staff of the Crop Protection Division in pest control work with special reference to biological control.

REFERENCES

George, O. Sride, 1974. Personal Communication.

Kanagaratnam, P., 1974. Report of the Crop Protection Division (1973), *Ceylon Cocon. Q.*, 26, 71-76.

Peries, O. S., 1974. Ganoderma Basal Stem Rot of Coconut. A New Record of the Disease In Sri Lanka. *Pl. Dis. Repr* 58, 293-295.

P. KANAGARATNAM
Officer-in-Charge,
Crop Protection Division.

REPORT OF THE BIOMETRY UNIT (1974)

1. STATISTICAL SERVICE

Routine analyses of experimental data of the Research Divisions were attended to. The Soil Chemist's, Agrostologist's and the Botanist's work constituted the major portion of the work. Designs for new experiments were also prepared for the above divisions and the joint experiments with the faculty of Agriculture, University of Sri Lanka.

Assistance was given to a number of other Institutions regarding design of experiments and analysis of experimental data. Those were the Coconut Cultivation Board, the Uda Walawe Cotton Research Station, Agricultural Research Station, Gannoruwa, Dry Zone Research Station, Maha Illuppallama, the Vidyalkankara Campus of the University of Sri Lanka and the post-graduate wing of the Vidyodaya Campus of the University of Sri Lanka.

2. RESEARCH

(i) Calibration Trial

The recordings of vegetative and yield characters of the palms of the above experiment at Ratmalagara Estate were maintained as per schedule.

(ii) Watering Experiment

This experiment was continued uninterrupted except for certain inevitable interruptions due to the faulty pipe-borne water system. Steps are now being taken to improve the water supply.

This experiment consists of the following treatments.

1. Control (i.e. Rainfed)
2. One dose at fortnightly intervals (IF)
3. One dose at weekly intervals (IW)
4. Double dose at fortnightly intervals (2F)

There are five replicates of the above treatments for each of three yield groups viz. low yielding palms, medium yielding palms and high yielding palms.

One dose constitutes 373.10 litres (82 gallons) of water poured on an area of 1.52 metres (5ft) radius around the base of the palm. This quantity simulates a rainfall of 5.08 centimetres (2 inches). We are not unconscious of the fact that 373.10 litres (82 gallons) poured around the base of the palm is strictly not the same as 5.08 centimetres (2 inches) of rain which covers the whole area because moisture will flow from the base of the palm to the dry portion in the centre of the coconut square in this form of watering. Moreover as watering is done on dry periods the surface evaporation is found to be high. Therefore it is very unlikely that the amount of effective moisture level available to the palm may be anything more than what is available through 2.54 centimetres (one inch) of rain. Anyway we have decided to continue with the same dosage for another three years to determine the influence of this reduced dosage on coconut yield because the full impact of watering will be felt only after four years, the life cycle of a bunch of coconuts being about 3½ years. Thereafter it is proposed to increase the dosage per palm.

(Note. Watering is done only during dry periods, that is, a certain length of dry spell, without at least 1.27 centimetres (0.50 inches) of rain. If rains occur, watering is put off based on the quantum of rain that fell. The number of days put off is according to a strict pre-schedule).

Although not much was expected after one year of this watering schedule we are giving below the yield data recorded for the different treatments.

Table 1. *Yield per hectare one year after watering*

| <i>Treatment</i> | <i>Nuts per hectare (1974)</i> | | | |
|------------------|--------------------------------|------------------------------|----------------------------|-------------------------|
| | <i>Low-yielding trees</i> | <i>Medium-yielding trees</i> | <i>High-yielding trees</i> | <i>Weighted Average</i> |
| Control .. | 6484 | 8223 | 15782 | 8943 |
| I W | 8223 | 10153 | 13726 | 10143 |
| I F | 7307 | 10628 | 17015 | 10652 |
| 2 F | 6894 | 9931 | 15246 | 9864 |

It is observed that even during the first year after watering at this reduced rate, there is an appreciable yield increase especially in the case of low and medium yielding trees. In the case of high yielding palms the response is not clear yet. While we could guess what has happened in the high yielding group we would prefer to put off our interpretation for a later date. Corrections have to be made for pre-experimental differences between plots.

(iii) Drought Index

The analytical work towards improving the Drought Index through which crop forecasting is done has had to be curtailed due to lack of funds for payment to the computer. A larger vote is however provided for in 1975.

(iv) Conversion Factor for converting husked nut weight of green nuts to copra weight

Preliminary arrangements were made to commence this experiment in 1975.

3. AGRICULTURE

(1) Meteorological stations

The three meteorological stations at B/E, R/E, I.S.G. were maintained satisfactorily.

The meteorological station at Bandirippuwa Estate has been selected by the U.N.D.P. expert at the Colombo Observatory to be one of their network of special Agri-meteorological stations in the Island. The necessary instruments are to be provided to us under U.N.D.P. aid in exchange for the data to be provided to them by us.

An enhanced allowance of Rs. 50/- per month (for observers) per station has been approved by the Coconut Research Board during the year.

(ii) Rainfall in 1974

The rainfall in the important coconut growing areas are shown in Table 2.

Table 2. *Rainfall in important coconut growing areas*

| Station | Total Rainfall | | | | Ave (.954-1973) | |
|--------------------------------|----------------|----------|------------------|----------|------------------|----------|
| | 1974 | | 1973 | | centi- metres | (inches) |
| | Centimetres | (inches) | centi- metres | (inches) | | |
| Lunuwila (Bandirippuwa Estate) | 167.23 | (65.84) | 206.93 | (81.47) | 198.98 | (78.34) |
| Madampe (Ratmalagara Estate) | 173.00 | (68.11) | 140.77 | (55.42) | 162.00 | (63.78) |
| Chilaw | 145.82 | (57.41) | 167.16 | (65.81) | 157.05 | (61.83) |
| Puttalam | 61.49 | (24.21) | 127.03 | (50.01) | 118.36 | (46.60) |
| Kurunegala | 187.86 | (73.96) | 148.13 | (58.32) | 225.48 | (88.77) |

(iii) **Drought indices in 1974**

The drought indices of some coconut areas (based on the interim method) for the year 1974 are shown in Table 3.

Table 3. *Drought Index in the coconut growing areas*

| Area | Drought Index | | Drought Index for the year | | |
|-----------------|----------------------|---------------|----------------------------|-------|-------|
| | mean for 10 years | Range | 1972 | 1973 | 1974 |
| 1. Tangalle | 152.0 | 30.1 — 414.6 | 448.7 | 68.8 | 251.9 |
| 2. Kudawewa | 196.0 | 0.0 — 457.6 | 448.7 | 409.8 | 151.4 |
| 3. Wariyapola | 213.0 | 0.0 — 526.8 | 538.1 | 413.8 | 117.0 |
| 4. Kuliypitiya | 152.5 | 0.0 — 288.2 | 429.7 | 370.8 | 48.2 |
| 5. Madampe | 320.9 | 0.0 — 569.1 | 670.2 | 523.9 | 123.9 |
| 6. Lunuwila | 146.1 | 0.0 — 407.7 | 282.2 | 185.8 | 137.6 |
| 7. Palavi | 536.4 | 43.0 — 885.6 | 672.2 | 523.9 | 902.4 |
| 8. Rajakadalawa | 278.9 | 0.0 — 465.4 | 660.5 | 446.0 | 355.3 |
| 9. Battuluoya | 447.2 | 167.9 — 754.8 | 660.5 | 628.5 | 938.0 |
| 10. Negombo | 141.6 | 0.0 — 305.4 | 378.5 | 288.2 | 168.4 |
| 11. Giriulla | 60.1 | 0.0 — 127.3 | 282.2 | 141.9 | 55.1 |
| 12. Kurunegala | 113.6 | 0.0 — 254.6 | 217.6 | 210.8 | 55.1 |
| 13. Polgahawela | 100.0 | 0.0 — 217.1 | 165.2 | 68.8 | 0.0 |

The drought index for a given year compared with the mean and also the range gives an idea of the crop prospects of the ensuing year in a given area.

(iv) **Crop prospects for 1975**

In 1975, crops will be better than in 1974 in almost all areas except in Puttalam district which experienced an abnormal failure of the Maha rains.

(v) **Forecast of total production in Ceylon**(a) **Verification of forecast for 1974**

| | |
|-------------------------------------|---------------------|
| Production forecast by CRB for 1974 | — 2534 million nuts |
| Production realised in 1974 | — 2353 " " |
| Error of forecast | — 7.7% |

Our forecast for 1974 seems to be on the higher side although there was an actual increase in production.

A comment on this aspect appears pertinent.

It would be noted that the production realised is estimated by adding the nut equivalent of exports to the internal consumption calculated at the rate of 140 nuts per head per annum.

We feel that during 1974, the domestic consumption has been far above 140 nuts per head in spite of the higher market price of nuts which under normal circumstances would have reduced domestic consumption. Due to the large acreage of coconut land vested with the Land Reform Commission and the (understandable) resultant lack of supervision, the villagers would have freely helped themselves to a liberal consumption of coconut both ripe as well as young at no cost. Therefore, the estimated production in 1974 which was based on the earlier rate of 140 nuts per head is found to be lower than the actual production.

We really forecast an increase of 11.5% in 1974 over 1973 whereas we have recorded only a 3.4% increase. This is a spurious situation arising from the above arguments. That the percentage increase should have been around 11.5% is evidenced by the crops for our two estates B/E and R/E shown below.

| <i>Estate</i> | | 1973 (nuts) | 1974 (nuts) | % increase |
|---------------------|----|-------------|-------------|------------|
| Bandirippuwa Estate | .. | 586,973 | 633,794 | *8.0 % |
| Ratmalagara Estate | .. | 597,463 | 719,987 | 20.5% |

(* in spite of several trees being tapped for toddy)

(b) Forecast for 1975

The forecast of production for 1975 = 2771 million nuts
 % increase over 1974 = 9.4%

4. PRODUCTION AND EXPORTS

The estimated production for the year 1974 was 2353 million nuts. This is 3.4% more than 1973, 12.0% less than the last five year average and 25.3% less than the previous highest production recorded in 1964.

The nut equivalent of exports for 1974 is 468 million. This is 11.0% more than in 1973, 47.6% less than the last five year average and 71.2% less than the previous highest recorded in 1964.

The average value of nut products per 1000 nuts in 1974 is Rs. 848.30. This is 146.8% higher than in 1973, 227.0% higher than the last five year average and 180.3% higher than the previous record in 1968.

5. GENERAL

- (i) The Biometrician continued to function as Consultant Biometrician to the R.R.I.C.
- (ii) As visiting lecturer at the Vidyodaya campus, the Biometrician lectured (a) on Applied Statistics to the final year undergraduates (week days) and (b) on Design of Experiments to the Students following the Post-graduate Diploma in Statistics (on Saturdays).
- (iii) The Biometrician gave a course of thirty lectures on Biometry at the Faculty of Agriculture, Peradeniya (Saturdays).

- (iv) The Biometrician served on two committees (a) Shell Charcoal and (b) Frozen Prawns as expert on sampling at the Bureau of Ceylon Standards.
- (v) Mr. D. T. Mathes (Graduate Technical Assistant) followed classes at the Vidyodaya Campus leading to the Diploma in Statistics which was a pre-condition insisted on by the British Council before he is accepted for the M.Sc. (Biometry) course at the University of Reading.

6. PERSONNEL

The following personnel served in the Biometry Unit during 1974.

| | | | |
|-----------------|---|------------------|-------------------|
| Biometrician | — | V. Abeywardena | F.I.S. (Lond.) |
| Graduate T.A. | — | D. T. Mathes | B.Sc. (Sri Lanka) |
| Tech. Assistant | — | P. Sunderalingam | B.Sc. (Sri Lanka) |

| | |
|-------------------------------|-------------------------|
| Senior Lab. & Field Assistant | G. Karunasena |
| Lab & Field Assistants: | (1) E. Ranjith Fernando |
| | (2) D. T. Fernandopulle |
| | (3) L. G. Fernando |
| | (4) I. Karunanayake |
| | (from 1st July 1974) |

| | |
|-------------------------|-----------------------------------|
| Lab & Field Attendants: | (1) W. E. R. Chandrasiri Fernando |
| | (2) W. B. Protus Fernando |
| | (From 1st July 1974) |

V. ABEYWARDENA
Biometrician

REPORT OF THE PLANTING DIVISION (1974)

PERSONNEL

Recruitments: Mr. N. M. S. Amarasiri was appointed Nursery Attendant as from 1.7.1974.

Promotions: Messrs P. P. Jayasundera and S. T. Fernando were appointed Field Assistants.

Transfers: Messrs B. D. G. Weerasuriya and J. S. Roberts were transferred to the Intercropping Division.

Messrs I. Joseph Fernando, A. Austin Silva and S. D. Mullewithana were transferred to the Administration Division.

Retirements: Mr. E. de Silva, Senior Field Assistant, retired from service in March 1974.

Nurseries: 15 nurseries were maintained during the year.

Seednuts planted for issue of seedlings in May/June and Oct./Nov. 1974 seasons

| <i>Nursery</i> | <i>May/June '74</i> | <i>Oct./Nov.'74</i> | <i>Total</i> |
|------------------------|---------------------|---------------------|------------------|
| 1. Alampil | — | 65,700 | 65,700 |
| 2. Attavillu | — | 198,725 | 198,725 |
| 3. Bandirippuwa | 33,225 | 42,070 | 75,295 |
| 4. Eraminigolla | 22,425 | 44,075 | 66,500 |
| 5. Handapangala | — | 74,000 | 74,000 |
| 6. Hettipola | 19,230 | 39,725 | 58,955 |
| 7. Ibbagamuwa | 53,160 | 205,800 | 258,960 |
| 8. Kalawewa | — | 74,200 | 74,200 |
| 9. Kilinochchi | — | 60,000 | 60,000 |
| 10. Koggala | 39,600 | 36,000 | 75,600 |
| 11. Mylambavelly | — | 59,375 | 59,375 |
| 12. Pallekelle | — | 61,450 | 61,450 |
| 13. Ratmalagara | 93,735 | 193,070 | 286,805 |
| 14. Walpita | 50,375 | 125,285 | 175,660 |
| 15. Wilpotha | 77,375 | 200,365 | 277,740 |
| Total | 3,89,125 | 1,479,840 | 1,868,965 |

Orders were booked and payments received in 1974 for 1,134,510 seedlings for the undermentioned issue seasons:—

| Nursery | May/June 1973 | Oct./Nov. 1973 | May/June 1974 | Oct./Nov. 1974 | Total |
|------------------|------------------|-------------------|------------------|-------------------|------------------|
| 1. Alampil | — | 1964 | — | 39,773 | 41,737 |
| 2. Attavillu | — | 625 | — | 136,840 | 137,465 |
| 3. Bandirippuwa | — | — | 35,588 | 48,443 | 84,031 |
| 4. Eraminigolla | — | — | 10,991 | 23,424 | 34,415 |
| 5. Handapangala | — | — | — | 42,396 | 42,396 |
| 6. Hettipola | — | — | 11,989 | 24,823 | 36,812 |
| 7. Ibbagamuwa | — | — | 22,440 | 116,168 | 138,608 |
| 8. Kalawewa | — | — | — | 49,907 | 49,907 |
| 9. Kilinochchi | — | — | — | 36,760 | 36,760 |
| 10. Koggala | — | 2476 | 32,849 | 27,922 | 63,247 |
| 11. Mylambavelly | — | 125 | — | 30,582 | 30,707 |
| 12. Pallekelle | — | — | — | 34,630 | 34,630 |
| 13. Ratmalagara | 100 | 710 | 60,874 | 70,367 | 132,051 |
| 14. Walpita | — | — | 46,625 | 51,771 | 98,396 |
| 15. Wilpotha | — | — | 39,172 | 134,176 | 173,348 |
| Total | 100 | 5900 | 260,528 | 867,982 | 1,134,510 |

909,200 seedlings were issued during the year 1974, and the distribution in nurseries for the various seasons was as follows:—

| Nursery | Oct./Nov. '73 | May/June '74 | Oct./Nov. '74 | Total |
|------------------------|----------------|----------------|----------------|----------------|
| 1. Alampil | 11,127 | — | 23,811 | 34,938 |
| 2. Attavillu | 3,525 | — | 68,455 | 71,980 |
| 3. Bandirippuwa | 460 | 16,041 | 22,741 | 39,242 |
| 4. Eraminigolla | — | 11,550 | 14,010 | 25,560 |
| 5. Handapangala | 7,500 | — | 32,370 | 39,870 |
| 6. Hettipola | — | 10,630 | 16,940 | 27,570 |
| 7. Ibbagamuwa | 650 | 31,800 | 100,709 | 133,159 |
| 8. Kalawewa | 1,350 | — | 36,116 | 37,466 |
| 9. Kilinochchi | 4,650 | — | 16,135 | 20,785 |
| 10. Koggala | 9,902 | 32,132 | 19,598 | 61,632 |
| 11. Mylambavelly | 4,625 | — | 25,907 | 30,532 |
| 12. Pallekelle | — | — | 27,773 | 27,773 |
| 13. Ratmalagara | 22,031 | 61,763 | 54,839 | 138,633 |
| 14. Walpita | 900 | 30,626 | 51,910 | 83,436 |
| 15. Wilpotha | 27,100 | 53,202 | 56,322 | 136,624 |
| Total | 938,200 | 247,744 | 567,636 | 909,230 |

| | |
|---|---------|
| Seedlings booked by smallholders | 520,166 |
| Seedlings booked by Estate owners | 204,105 |
| Seedlings booked by Govt. Agents | 129,271 |
| Seedlings booked by Govt. Depts. and similar Institutions | 213,549 |
| Seedlings booked under Crop Diversification Scheme | 14,577 |
| Seedlings booked under Rehabilitation of Smallholdings | 52,592 |
| Seedlings supplied to Kwait (foreign order) | 250 |

Total number of seedlings. 1,134,510

P. D. L. FERNANDO
Planting Officer

REPORT OF THE PUBLICATIONS/PUBLICITY UNIT AND LIBRARY (1974)

Publications

Ceylon Coconut Quarterly - Volume XXIV Nos 1/2 and 3/4 of this journal was approved and sent to the press during the year.

Pol Pawath - Volume 5 No. 4 was published during the year:

Leaflets - The following leaflets were reprinted during the year.

In Sinhala: 20,28 (Nos.)

In Tamil: 17 (No.)

Following leaflets were sent during the year for reprinting:

In Sinhala: Nos. 9, 16, 17, 24, 25, 29, 33, 36, 40, 41, 43, 46, 47, 48, 52.

In Tamil: Nos. 2, 20, 21, 21, 25, 34, 36, 37, 38, 41, 42, 43, 44

In English: Nos. 5, 41, 42.

Translations - The *Ceylon Coconut Planters' Review* Vol. 7 No. 1 was translated into Sinhala to appear as '*Pol Pawath*' Vol. 5 No. 4.

Personnel - The Publications/Publicity Officer, Mr. M. S. S. Fernandopulle, left the island on a Commonwealth Scholarship on 1974-09-11 to join the Indian Institute of Mass Communication, New Delhi, to follow the Post-graduate Diploma Course in Journalism for Developing Countries. Mr. M. J. C. Perera, Librarian, was appointed to act as officer-in-charge of the Unit with effect from this date.

Library

During the year 140 books and 30 journals were received under the Overseas Development Agency Book Presentation Programme. Book purchasing and subscription to journals had to be limited due to foreign exchange restrictions.

Library Bulletin:- Four issues at quarterly intervals of this bulletin (in mimeograph form) were issued during the year.

Museum

During the year work of the museum was started. Wall cupboards and several models have been prepared and installed.

M. J. C. PERERA
Officer-in-Charge,
Publications/Publicity Unit and Library.

REPORT OF THE ADMINISTRATION DIVISION (1974)

CADRE

The staff of the Coconut Research Board at the end of December, 1974 was as follows:—

| GRADE | CLASS | | | | | Total |
|-------------------------|---------|-----|-----|-----|----|-------|
| | Special | I | II | III | IV | |
| Contract Officers | 3 | — | — | — | — | 3 |
| Executive | — | 3 | 2 | 16 | 2 | 23 |
| Technical & Supervisory | 11 | 11 | 22 | — | — | 44 |
| Intermediate | 4 | 4 | 4 | — | — | 8 |
| Clerical & Allied | — | 17 | 22 | — | — | 39 |
| Operative | — | 18 | 38 | — | — | 56 |
| Minor | 29 | 100 | 111 | — | — | 240 |
| | 3 | 44 | 153 | 199 | 16 | 413 |

PROMOTIONS DURING THE YEAR 1974 - INTERNAL

The following internal promotions were made during the year:

Operative Grade: Messrs K. P. C. Fernando, D. Amarasinghe, B. G. D. Weerasuriya and J. S. Roberts as Field Assistants from 7.5.74, Messrs K. Austin Silva, R. L. A. Perera, P. P. Jayasundera and Shelton T. Fernando as Field Assistants from 1-7-74, and Mr. S. D. Mullevithana as Field Assistant from 25-10-74;

Clerical & Allied Grade: Messrs I. Joseph Fernando, B. M. Dingiri Banda and R. D. Dayasena as Clerks from 22-4-74;

Minor Grade Class I: Messrs S. M. N. Amarasiri, J. M. S. N. Appuhamy and P. J. Callistus Fernando as Field Attendants from 1-7-74;

Messrs J. S. Hubert, W. S. M. Anaclitus Fernando, K. D. David Appuhamy, W. B. Protus Fernando and R. D. Chandrapala as Lab & Field Attendants from 1-7-74;

Messrs H. P. Piyawardena, P. George Kamal, W. W. S. Anthony Fernando, and M. A. Karunadasa as Two Wheel Tractor Operators from 10-12-74; Mr. W. P. Fernando as a Two Wheel Tractor Operator from 18-12-74;

Messrs Sunil Abeywickrama and M. Ramasamy as Calf Keepers from 13-12-74 and 1-12-74 respectively;

Minor Grade Class II: Mr. R. M. Chandrasena as Lorry Cleaner from 17-3-74, Mrs. T. M. Alice Silva as Ladies Hostel Labourer from 1-4-74 and Mr. A. Dayaratne as a Labourer Helper from 1-2-74;

Messrs K. D. L. Gunatilake and P. Dingiribanda as Watchers from 13-05-74 and 19-06-74 respectively; Messrs I. M. Ranasinghe, M. D. Lawrence Appuhamy and K. L. P. Sunil as Watcher from 18-11-74. Mr. D. Samson Fernando was appointed watcher in 1974 with retrospective effect from 3-12-1973.

EXTERNAL APPOINTMENTS

The following appointments were made during the year:

Executive Grade Class III: Mr. V. U. de S. Jayasuriya, and Miss Seetha Menike Kulathunga, as Research Assistants, from 2-5-74; Miss S. P. Abeysekera, as Assistant Administrative Officer from 10-10-74;

Executive Grade Class IV Messrs K. Karunanayake, M. de S. Liyanage and S. B. de Saram as Experimental Officers from 1-4-74; Messrs B. H. S. Jayawardena and D. M. P. Ashley Perera as Assistant Accountants from 2-9-74 and 16-11-74 respectively;

Misses G. V. Mallika, S. Periyathamby and M. C. L. Fernando, and Mr. B. C. N. Peiris as Technical Assistants from 1-7-74, 51-8-74, 4-11-74 and 1-8-74 respectively.

Operative Grade Class II: Mr. L. Dias as Transport Officer from 1-1-74; Messrs A. M. Sirinimal and O. A. Wijesiri as Field Assistants from 7-5-74; Messrs K. P. D. G. I. Karunanayake and U. Sunil Shantha Perera as Lab/Field Assistants from 1-07-74;

Clerical and Allied Grade Class II: Miss A. A. de Soysa as Clerk from 22-4-74.

Minor Grade Special Class: Messrs W. L. Dunston Fernando, D. P. Ranasinghe and W. P. Sirisena as Tractor Operators from 1-4-74, 24-4-74, and 1-8-74 respectively.

RETIREMENTS

Messrs Earnest de Silva, Senior Field Assistant, H. M. Abraham Appuhamy, Building Labourer and S. Edirisinghe, Conductor retired from services of the Board from 22-3-74, 28-3-74 and 14-01-74 respectively.

RESIGNATIONS

Messrs H. P. Dharmasena, Pollination Labourer, S. B. de Saram, Experimental Officer, T. Karunaratne, Clerk, C. S. E. Fernando, Assistant Administrative Officer and the Assistant Accountants Messrs L. G. Gunasiri, B. H. S. Jayawardena and D. M. P. A. Perera, resigned from the services of the Board with effect from 15-04-74, 10-05-74, 01-09-74, 02-09-74, 15-07-74, 15-10-74 and 30-11-74 respectively.

WELFARE

The Housing Committee continued to function with Deputy Director (Administration & Finance) as Chairman and Representatives from the three Unions as Committee members. Four Meetings were held during the year.

Workmen's Compensation

All temporary disablement cases were attended to promptly. The Board continued to give cover to the first seven days of disablement as a special concession. There were no fatal accidents.

Recreation and Cultural Activities

The C. R. I. Recreation Club, the C. R. I. Art Circle and the C. R. I. Catholic Association continued to make satisfactory progress during the year.

Financial Aid

The Scheme of Provident Fund, Distress and Transport Loans continued to operate on the usual terms. Festival Advances to all employees who were drawing a salary less than Rs. 520/- were granted during the year. In addition a recoverable advance of a month's salary up to a maximum of Rs. 500/- was paid at the end of the year to all permanent employees of the Board.

Medical Aid

The Medical Aid Committee met six times during the year, at which a sum of Rs. 22,617.84 was paid to members on claims. All employees who accepted the new salary scales ceased to be members of the Fund and only those who continue to draw the old salary scales are entitled to medical aid facilities.

General

The employer-employee relationships continued to remain cordial and whatever disputes that arose were amicably and satisfactorily settled.

K. D. J. WILMOT

Deputy Director (Administration & Finance).

REPORT ON ESTATES (1974)

(1) BANDIRIPPUWA ESTATE, LUNUWILA

| Area Statement | | Hectares | (A R P) | | |
|----------------|---------|----------|-----------|----|-----|
| Area | | | A | R | P |
| Bandirippuwa | (1) | 61.92 | 153 | 00 | 00 |
| Bandirippuwa | (2) "A" | 47.85 | 118 | 0 | 38 |
| Bandirippuwa | (2) "B" | 24.25 | 59 | 3 | 26 |
| Bandirippuwa | (2) "C" | 14.08 | 34 | 3 | 07 |
| Total | | 148.10 | 365 | 3 | 31 |
| Research | | 58.68 | 145 | 0 | 00 |
| Estate | | 82.20 | 203 | 0 | 17 |
| Buildings etc. | | 6.88 | 17 | 0 | 000 |
| Paddy etc. | | 0.34 | 0 | 3 | 14 |
| Total | | 148.10 | 365 | 3 | 31 |

| Distribution of area by Blocks | | | Research | | | Estate | | | Total | | | | | |
|--------------------------------|-----|----------|----------|-----|---|----------------|-------|-----|--------|----------|--------|-----|----|----|
| Blocks | | Hectares | A | R | P | Hectares | A | R | P | Hectares | A | R | P | |
| B/E | (1) | 1 | 1.21 | 3 | 0 | 00 | 10.52 | 26 | 0 | 00 | 11.74 | 29 | 0 | 00 |
| " | " | 2 | 0.00 | 00 | 0 | 00 | 5.67 | 14 | 0 | 00 | 5.67 | 14 | 0 | 00 |
| " | " | 3 | 4.86 | 12 | 0 | 00 | 4.45 | 11 | 0 | 00 | 9.31 | 23 | 0 | 00 |
| " | " | 4 | 2.02 | 5 | 0 | 00 | 15.02 | 37 | 0 | 17 | 17.04 | 42 | 0 | 17 |
| " | " | 5 | 3.64 | 9 | 0 | 00 | 5.26 | 13 | 0 | 00 | 8.90 | 22 | 0 | 00 |
| " | " | 6 | 2.43 | 6 | 0 | 00 | 2.02 | 5 | 0 | 00 | 4.45 | 11 | 0 | 00 |
| B/E | (2) | A | 26.72 | 66 | 0 | 00 | 20.23 | 50 | 0 | 00 | 46.94 | 116 | 0 | 00 |
| " | " | B | 10.52 | 26 | 0 | 00 | 12.55 | 31 | 0 | 00 | 23.07 | 57 | 0 | 00 |
| " | " | C | 7.28 | 18 | 0 | 00 | 6.47 | 16 | 0 | 00 | 13.76 | 34 | 0 | 00 |
| | | | 58.68 | 145 | 0 | 00 | 82.19 | 203 | 0 | 17 | 140.88 | 348 | 0 | 17 |
| | | | | | | Buildings etc. | | | | 6.88 | 17 | 0 | 00 | |
| | | | | | | Paddy etc. | | | | 0.34 | 0 | 3 | 14 | |
| Grand Total | | | | | | | | | 148.10 | 365 | 3 | 31 | | |

CENSUS OF PALMS (ENDED 1973)

| | 1 | 2 | 3 | 4 | 5 | 6 | A | B | C | Total |
|---------------|-------|-----|-------|-------|-------|-----|-------|-------|-------|--------|
| Full Bearing | 1660 | 801 | 1223 | 2041 | 1154 | 545 | 3970 | 1974 | 1745 | 15113 |
| Tapping Palms | 6 | | 83 | 13 | | 85 | 415 | 440 | 427 | 1469 |
| Duds | 1 | | 3 | 21 | 1 | 8 | 110 | 150 | 30 | 324 |
| In Flowers | 4 | | 3 | 1 | 4 | 4 | 162 | | 3 | 181 |
| Established | 25 | | 31 | 17 | 4 | 1 | 375 | 5 | 13 | 471 |
| Seedlings | 9 | | 5 | 6 | 2 | | 1511 | 460 | 2 | 1995 |
| Vacancies | 148 | 81 | 185 | 418 | 213 | 112 | 658 | 471 | 405 | 2611 |
| Total | 1,853 | 882 | 1,453 | 2,517 | 1,378 | 755 | 7,201 | 3,500 | 2,625 | 22,164 |

Comparative Rainfall 1973 / 1974 with wet days

| Month | Centi- Metres | 1973 Inches | Wet days | Centi- metres | 1974 Inches | Wet days | 5 years to- Rainfall 68-72 Cen- ti metres | Inches | Centi- meters | 5 years Average 1968-1972 Inches |
|-----------|------------------|----------------|----------|------------------|----------------|----------|--|--------|------------------|---|
| January | — | — | — | — | — | — | 18.42 | 7.25 | 3.68 | 1.45 |
| February | 3.45 | 1.36 | 1 | 9.91 | 3.90 | 4 | 32.89 | 12.95 | 6.58 | 2.59 |
| March | 9.98 | 3.93 | 6 | 1.37 | 0.54 | 2 | 31.55 | 12.42 | 6.30 | 2.48 |
| April | 17.04 | 6.71 | 11 | 51.21 | 20.16 | 16 | 114.76 | 45.18 | 22.94 | 9.03 |
| May | 12.62 | 4.97 | 17 | 39.75 | 15.65 | 20 | 108.15 | 45.58 | 21.77 | 8.57 |
| June | 16.13 | 6.35 | 16 | 6.73 | 2.65 | 12 | 57.53 | 22.65 | 11.51 | 4.53 |
| July | 3.10 | 1.22 | 11 | 14.17 | 5.58 | 15 | 29.69 | 11.69 | 5.94 | 2.34 |
| August | 1.17 | 0.46 | 5 | 10.52 | 4.14 | 8 | 14.15 | 5.57 | 2.82 | 1.11 |
| September | 0.64 | 0.25 | 3 | 13.46 | 5.30 | 20 | 55.96 | 22.03 | 11.20 | 4.41 |
| October | 21.34 | 8.40 | 17 | 5.72 | 2.25 | 7 | 173.89 | 68.46 | 34.77 | 13.69 |
| November | 14.73 | 5.80 | 9 | 14.76 | 5.81 | 8 | 83.62 | 32.92 | 16.71 | 6.58 |
| December | 26.49 | 10.43 | 19 | 5.89 | 2.32 | 5 | 65.68 | 25.86 | 13.13 | 5.17 |
| Total | 126.69 | 49.88 | 115 | 173.49 | 68.30 | 117 | 786.29 | 309.56 | 157.35 | 61.95 |

D. C. ELLAWELA

CROPS

Total Crops from 1970 to 1974 with the respective averages

| <i>Crop</i> | 1970 | 1971 | 1972 | 1973 | 1974 | <i>Total</i> | <i>5 year Average</i> |
|--------------|----------------|------------------|----------------|----------------|----------------|------------------|-----------------------|
| 1st Crop | 96,588 | 149,980 | 170,178 | 63,006 | 65,817 | 545,569 | 109,114 |
| 2nd Crop | 152,715 | 185,612 | 238,852 | 94,330 | 93,628 | 765,137 | 153,027 |
| 3rd Crop | 209,388 | 234,371 | 207,761 | 148,488 | 154,725 | 954,733 | 190,946 |
| 4th Crop | 181,506 | 205,893 | 160,942 | 143,812 | 141,426 | 833,579 | 166,716 |
| 5th Crop | 151,414 | 160,776 | 129,772 | 81,106 | 91,250 | 614,318 | 122,864 |
| 6th Crop | 128,540 | 147,736 | 60,794 | 56,231 | 86,948 | 480,249 | 96,050 |
| Total | 920,151 | 1,084,368 | 968,299 | 586,973 | 633,794 | 4,193,585 | 838,717 |

CROP DISPOSAL (6 Crops 1974)

| | | | |
|----------------------------------|----|----|----------------|
| Sold to Coconut Processing Board | .. | .. | 125,080 |
| Converted into Copra | .. | .. | 427,866 |
| Sold to Staff | .. | .. | 27,757 |
| Nut Allowance | .. | .. | 3,0444 |
| Sold to Research Divisions | .. | .. | 2,916 |
| Missing | .. | .. | 2,739 |
| Empties | .. | .. | 16,992 2.6% |
| Total | .. | .. | 633,794 |

1,500 palms in the Estate were used for tapping and about 4 hectares (10 acres) were uprooted for a trial. The copra out-turn was 1,369 nuts per 254.01kgs (per candy).

Field Notes

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

(1) Weeding

Weeds have been effectively controlled in the Estate.

(2) Draining

All drains have been maintained in good order. 227.50 metres (125 fathoms) of new drains were opened during the year.

D. C. ELLAWELA
Superintendent,
Bandirippuwa Estate.

(2) RATMALAGARA ESTATE, MADAMPE (1974)

| Area Statement | | | | | | |
|---------------------|-------|----------|-------|----|----|---|
| Area | | Hectares | A. | R. | P. |) |
| Research Section | .. .. | 78.40 | (196 | 0 | 0 |) |
| Estate Section | .. .. | 16.00 | (40 | 0 | 0 |) |
| Roads & Buildings | .. .. | 2.00 | (5 | 0 | 0 |) |
| Jungle & Waste Land | .. .. | 7.60 | (19 | 0 | 0 |) |
| Nurseries | .. .. | 5.20 | (13 | 0 | 0 |) |
| Total | | 109.20 | (273 | 0 | 0 |) |

Distribution of Area by Research Divisions

| Division | | Hectares (A. R. P.) | | | | |
|------------------------------------|-------|-----------------------|-------|---|---|---|
| Botany Division | .. .. | 15.40 | (38 | 2 | 0 |) |
| Soil Chemistry Division | .. .. | 18.00 | (45 | 0 | 0 |) |
| Agrostology Division | .. .. | 20.80 | (52 | 0 | 0 |) |
| Intercropping and Animal Husbandry | .. .. | 23.20 | (58 | 0 | 0 |) |
| Biometry | .. .. | 1.00 | (2 | 2 | 0 |) |
| Planting Division | .. .. | 5.20 | (13 | 0 | 0 |) |
| Estate Section | .. .. | 16.00 | (40 | 0 | 0 |) |
| Roads & Buildings | .. .. | 2.00 | (5 | 0 | 0 |) |
| Jungle & Waste Land | .. .. | 7.60 | (19 | 0 | 0 |) |
| Total | | 109.20 | (273 | 4 | 0 |) |

Census of Palms

Field Nos.

| Particulars | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Bot.B. | Total |
|--------------|-------|-----|-----|-------|-------|-------|-------|-----|--------|--------|
| Full Bearing | 1,573 | 222 | 757 | 1,377 | 1,169 | 1,583 | 2,561 | 332 | 2,706 | 12,280 |
| In Flower | — | — | — | 15 | — | — | 81 | 2 | 116 | 214 |
| Young Palms | 24 | — | 5 | 69 | — | — | 93 | — | 146 | 337 |
| Duds | 23 | 11 | 25 | 17 | — | 45 | 26 | 6 | — | 153 |
| Vacancies | 11 | 7 | 37 | 45 | 2 | 61 | 33 | 15 | 167 | 378 |
| <hr/> | | | | | | | | | | |
| | 1,631 | 240 | 824 | 1,523 | 1,171 | 1,689 | 2,794 | 355 | 3,135 | 13,362 |

Total Crops from 1969 to 1974

| Pick No. | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|-----------|---------|---------|-----------|-----------|---------|---------|
| 1 | 144,718 | 105,702 | 136,883 | 153,485 | 46,072 | 54,434 |
| 2 | 197,352 | 119,474 | 194,549 | 203,711 | 76,893 | 97,956 |
| 3 | 192,682 | 170,522 | 184,576 | 198,611 | 114,695 | 141,785 |
| 4 | 149,919 | 154,242 | 215,698 | 218,160 | 173,025 | 198,568 |
| 5 | 83,622 | 102,138 | 157,402 | 126,332 | 114,464 | 95,908 |
| 6 | 63,099 | 103,141 | 134,132 | 104,521 | 72,314 | 135,588 |
| <hr/> | | | | | | |
| Nut Total | 831,392 | 755,219 | 1,023,240 | 1,004,820 | 597,463 | 724,239 |

Crop disposal for 1974

| | | | | |
|-------------------------|----|----|----|----------------|
| Nuts cured into copra | .. | .. | .. | 629,035 |
| Nuts sold on contract | .. | .. | .. | 38,018 |
| Nuts issued to Research | .. | .. | .. | 9,679 |
| Allowances to Staff | .. | .. | .. | 12,005 |
| Empties, Rejections | .. | .. | .. | 20,712 |
| Missing | .. | .. | .. | 14,790 |
| Total | .. | .. | .. | <u>724,239</u> |

Copra

The 629,035 nuts converted into copra resulted as follows:

- No. 1 Copra - 86,798.05 kgs (341 Candies 409 lbs) being 79.58%
- No. 2 Copra - 15,957.25 kgs (62 Candies 465 lbs) being 14.63%
- No. 3 Copra - 6,350.00 kgs (25 Candies 000 lbs) being 5.79%
- Total - 109,107.30 kgs (429 Candies 314 lbs)

The Copra out-turn was 1464. This is the total average inclusive of the Botanist's Dwarf Palm Block.

The percentage of empties was 1.90%.

Field Notes

The following Research Divisions continue to maintain their experimental work at Ratmalagara. Excepting the Biometry Unit resident officers are in charge of the Research Operations.

1. Botany Division
2. Soil Chemistry Division
3. Agrostology Division
4. Intercropping & Animal Husbandry Division
5. Biometry Division

A cattle herd of 133 animals was maintained at Ratmalagara by the Intercropping and Animal Husbandry Division.

The herd particulars are as follows:

| | |
|-------------|----|
| Stud Bulls | 2 |
| Cows | 79 |
| Heifers | 30 |
| Bull Calves | 22 |

All field works estimated for the year have been carried out. Estate palms were manured with 4.50 kgs(10 lbs.) CRI 'C' mixture. The manure was broadcast in an area 1.82 metres (6 ft) round the palm and then turned in with mamoties. Drains and drain bunds were maintained in good condition. All buildings, fences and estate roads were well maintained.

The main drawback has been the lack of a vehicle at Ratmalagara. A vehicle is a sine qua non for any Research Station. Attending to labour casualties, sick calls and assisting the Police in instances of numerous thefts that took place last year were greatly hampered owing to the lack of a vehicle. It is my fervent hope that a permanent vehicle will be stationed at Ratmalagara in the coming year.

R M. de SILVA
Superintendent,
Ratmalagara Estate.