COCONUT RESEARCH BOARD

# COCONUT RESEARCH INSTITUTE OF SRI LANKA

## REPORT FOR 1987

COCONUT RESEARCH INSTITUTE — REPORT FOR 1987

# COCONUT RESEARCH BOARD

# REPORT OF THE

# COCONUT RESEARCH INSTITUTE

# FOR 1987

Editor

R. Mahindapala, Ph.D. (Exon), F.I. Biol (S.L.)

# CONTENTS

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(as at 31st December, 1987)

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(as at 31st December, 1987)

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# COCONUT RESEARCH INSTITUTE OF SRI LANKA

## THE STAFF*

**(as at 31 December, 1987)**

## DIRECTORATE

**Director**—R. Mahindapala, B.Sc, M.Sc (Exon), Ph.D (Exon), M.I. Biol (S.L.)

**Acting Deputy Director (Research)**—R. Mahindapala, B.Sc, M.Sc (Exon), Ph.D(Exon), M.I.Biol (S.L.)

**Deputy Director (Administration and Finance)**—D. N. B. Perera, B.Sc

## RESEARCH DIVISIONS

**Soils and Plant Nutrition Division**

| | | |
|---|---|---|
| *Head* | — | M. Jeganathan, B.Sc (Lond), M. Phil ((Lond) |
| *Assistant Soil Scientists* | — | Miss M. B. M. N. Dias, B.Sc Agric.** |
| | | Miss M. G. F. S. Ferdinandes, B.Sc. Agric. |
| | | K. S. Jayasekara, B.Sc, C.Chem, M.I. Chem. |
| | | L. L. W. Somasiri, B.Sc |
| | | N. A. Tennakoon, B.Sc Agric. |
| | | L. P. Vidana Arachchi, B.Sc. Agric. |
| *Senior Technical Assistants* | — | T. W. Fernando, L.I. Chem. C |
| | | G. D. George |
| *Technical Assistants* | — | Mrs. G. S. Amarasekera |
| | | Mrs. N. H. R. M. de Silva, B.Sc |
| | | N. P. Gunaratne |
| | | Miss S. D. Hemamala, B.Sc |
| | | D. P. Panditharatne |
| | | U. S. S. Perera |
| | | Miss S. Periyathamby, N.D.S. |
| | | Mrs. S. M. Ratnayake |
| | | Mrs. D. M. D. I. Wijebandara, B.Sc |

*When more than one officer is listed under a designation, the names appear in alphabetical order. Unless otherwise stated, all Bachelor's degrees indicated in the staff list are from Universities in Sri Lanka.

**Overseas study leave.

| | | |
|---|---|---|
| *Lab and Field Assistants* | — | A. M. P. Attanayake<br>E. M. A· Thilakaratne Banda<br>K. V. W. de Silva<br>A. A. Fernando<br>P. M. Harischandra<br>K. Murugiah<br>S. A. Peiris<br>B. C. E. Perera<br>D. S. Wijetunga |
| *Typist (English)* | | H. M. W. S. Athauda |

**Genetics and Plant Breeding Division**

| | | |
|---|---|---|
| *Head* | — | Miss M. R. T. Wickramaratne, B.Sc, Ph.D (Lond), DIC |
| *Assistant Genetisists/Plant Breeders* | — | Mrs. W. M. U. Fernando, B.Sc<br>Miss I. J. S. Kondasinghe, B.Sc Agric.<br>K. R. R. A. Peiris, B.Sc Agric.**<br>W. G. .A .Ratnasiri, B.Sc. Agric. |
| *Technical Assistants* | — | Miss M. A. S. Fernando<br>Mrs. W. B. S. Fernando<br>Miss H. S. G. Kularatne<br>M. H. L. Padmasiri<br>H. P. P. H. Pathirana |
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| *Clerk* | — | K. P. W. Perera |
| *Clerk/Typist* | — | Miss I. N. Jayawardene |

**Seed Production Unit**

| | | |
|---|---|---|
| *Seed Production Officer* | — | P. Kariyawasam, Dip. Agric |
| *Lab and Field Assistant* | — | H. Bandappuhamy |
| *Clerk/Typist* | — | Mrs. Manel Rodrigo |

**Isolated Seed Garden**

| | | |
|---|---|---|
| *Superintendent* | — | D. M. Pathirage |
| *Field Officer* | — | G. B. A. Wijesekera |
| *Lab and Field Assistants* | — | R. B. Attanayake<br>U. V. M. Fernando |
| *Clerk/Typists* | — | R. P. Victor<br>B. Raymond Fernando |

**Agronomy Division**

| | | |
|---|---|---|
| *Head* | — | Mrs. L. V. K. Liyanage, B.Sc. Agric.<br>M.Sc (New England) |
| *Assistant Agronomists* | — | K. B. Dassanayake, B.Sc. Agric.<br>D. N. S. Fernando, B.Sc. Agric.**<br>T. G. L. G. Gunasekera, B.Sc. Agric.<br>H. A. J. Gunathilake, B.Sc. Agric**.<br>H. P. S. Jayasundara, B.Sc. Agric.<br>M. de S. Liyanage, B.Sc. Agric.<br>M.Sc. (New England)<br>R. A. J. R. Perera, B.Sc Agric. |
| *Senior Technical Assistant* | — | M. Bastian |
| *Technical Assistants* | — | H. A. Abeysoma<br>M. H. F. G. Ivan Appuhamy<br>M. J. I. Costa<br>R. Marasinghe<br>Mrs. K. C. P. Perera<br>S. D. J. N. Subasinghe<br>A. M. U. Wijeratne |
| *Lab and Field Assistants* | — | D. Amarasinghe |
| | — | E. M. Gunaratne Banda |
| | | W. S. M. A. Fernando<br>M. D. V. Saparamadu<br>B. D. Benet Silvan<br>W. E. J. Tissera |
| *Clerk/Typist* | — | A. A. D. N. Athauda |

**Crop Protection Division**

| | | |
|---|---|---|
| *Head* | — | P. Kanagaratnam, B.Sc Agric, Ph.D (Lond) D.I.C., M.I.Biol. (S.L.) |
| *Crop Protection Officer* | — | P. A. C. R. Perera, B.Sc (Lond), M.Sc (Lond) Ph.D (Lond), D.I.C. |
| *Assistant Crop Protection Officers* | — | Mrs. L. C. P. Fernando, B.Sc Agric.<br>Mrs. C. N. K. Rajapakse, B.Sc Agric. |
| *Technical Assistants* | — | K. A. S. Chandrasiri<br>K. F. G. Perera |
| *Clerk* | — | Mrs. Anula de Zoysa |
| *Lab and Field Assistants* | — | W. E. A. Fernando<br>D. M. Jayakody<br>A. S. M. Premalal |

**Coconut Processing Research Division**

| | | |
|---|---|---|
| *Officer-in-charge* | — | R. Mahindapala, B.Sc, M.Sc, Ph.D |
| *Experimental Officer* | — | G. M. R. Karunasekera, B.Sc |
| *Senior Technical Assistant* | — | P. A. D. G. A. Appuhamy |
| *Technical Assistant* | — | A. H. Norman |
| *Lab and Field Assistant* | — | L. W. Theodore |

**Biometry Unit**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | D. T. Mathes, F.I.S(Lond), B.Sc<br>Dip.Stat.(Vidyodaya), Dip.Biometry(Reading) |
| *Biometrician* | — | T. S. G. Peiris, B.Sc, M.Sc (Canterbury) F.S.S. |
| *Technical Assistant* | — | H. P. De Zoysa |
| *Senior Field Assistant* | — | E. Ranjith Fernando |
| *Lab and Field Assistants* | — | A. Dassanayake<br>M. W. L. G. Fernando<br>P. J. C. Fernando<br>W. E. R. C. Fernando<br>W. B. P. Fernando<br>U. T. G. Fernando<br>D. T. Fernandopulle<br>W. K. M. K. Herath<br>J. Wijedasa<br>A. Wilson |
| *Clerk/Typist* | — | Mrs. D. M. T. Marasinghe |

**Tissue Culture Unit**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | Mrs. S. M. Karunaratne, B.Sc, M.Sc (Qld) |
| *Research Assistant* | — | Miss L. K. Periyapperuma, B.Sc |
| *Technical Assistants* | — | Miss K. D. Cecily<br>Miss C. K. A. Gamage |
| *Lab and Field Assistant* | — | W. H. N. Jayatissa |

**Plant Physiology Unit**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | Mrs. C. Jayasekera, B.Sc |
| *Assistant Physiologist* | — | Miss S. P. Suriyapperuma, B.Sc |
| *Technical Assistants* | — | Mrs. P. K. K. Fernando<br>R. D. N. Premasiri |
| *Lab and Field Assistant* | — | A. Jayathilake |

**Information Services Unit**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | P. A. Henry Nimal Appuhamy, B.Sc. Agric. |
| *Assistant Information Officer* | — | J. L. J. G. Pinto |
| *Technical Assistant (Photography)* | — | T. R. W. Weralupitiya |
| *Artist* | — | D. W. Hapuarachchi |
| *Clerk/Typist* | — | R. A. L. C. Fernando |

**Coconut Information Centre/Library**

| | | |
|---|---|---|
| *Librarian/Project Leader* | — | M. J. C. Perera, ALA |
| *Documentation Officer* | — | Mrs. P. A. S. F. Perera, B.Sc. |
| *Documentation Assistant* | — | D. B. Jayasinghe |
| *Library Assistants* | — | Mrs. P. D. U. C. Dharmapala<br>Miss T. I. I. Peiris |
| *Clerk/Typist* | — | Miss S. N. Gunathilake |
| *Machine Operator* | — | W. G. L. Rodrigo |

## ADMINISTRATION

| | | |
|---|---|---|
| *Deputy Director (Administration and Finance)* | — | D. N. B. Perera, BSc. |

**Establishment**

| | | |
|---|---|---|
| *Office Assistant* | — | J. E. A. Dalpathado |
| *Personnel Officer* | — | P. Daluwatta |
| *Administrative Assistant* | — | M. Leelaratne, B.A. |

| | | |
|---|---|---|
| *Supplies Officer* | — | M. A. Somadasa |
| *Secretary to the Chairman* | — | Mrs. T. M. H. Fernando |
| *Stenographers (English)* | — | Mrs. M. J. Ariyadasa<br>Mrs. M. P. Premaratne<br>Mrs. S. Z. Suhair |
| *Clerk/Typists* | — | Miss W. E. M. Coonghe<br>Mrs. P. C. A. Fernando<br>C. B. B. P. Fernando<br>Mrs. M. M. M. R. Fernando<br>Miss W. S. Renuka Fernando<br>T. Gunadasa<br>Miss U. I. Gunasekera<br>K. D. Jathiratne<br>J. D. Ratnasekera<br>W. A. W. Wijesuriya |
| *Clerks* | — | B. N. Dingiribanda<br>A. I. F. Fernando<br>Miss. H. D. Mangalika, B.A |
| *Record Keeper* | — | I. H. Nelson |
| *Receptionist/Telephone Operator* | — | Miss L. M. N. Jansz |

**Accounts**

| | | |
|---|---|---|
| *Chief Accountant* | — | R. M. G. D. Rajapakse |
| *Accountant* | — | D. R. C. M. Handalage |
| *Accounting Assistant* | — | T. H. G. A. G. Perera |
| *Book Keepers* | — | B. M. Jayathilake Banda<br>Mrs. D. M. R. Fernando<br>A. S. Nanayakkara<br>Mrs. K. M. A. Nonis<br>T. M. S. Peiris |

| | | |
|---|---|---|
| *Store Keeper* | — | M. B. Upali |
| *Shroff* | — | P. A. Nonis |
| *Assistant Shroff* | — | H. B. Thalgahagoda |
| *Head/Clerk* | — | R. H. B. Silva |
| *Clerk/Typists* | — | D. M. C. B. Dissanayake<br>Mrs. A. R. S. Hettiarachchi<br>Mrs. J. K. F. Perera<br>Mrs. C. M. B. I. Salwatura<br>D. G. M. Weerasinghe<br>Y. H. Wijesena |
| *Clerks* | — | Mrs. C. Munasinghe<br>Mrs. P. H. C. M. G. Rodrigo<br>W. M. S. Wijetunge |

**Internal Audit Unit**

| | | |
|---|---|---|
| *Internal Auditor* | — | D. G. Manamudali, B.A, Licentiate, I.C.A. |
| *Checking Officer* | — | P. R. Fernandopulle |
| *Internal Audit Clerks* | — | M. R. U. Attanayake<br>Mrs. M. M. J. R. Fernando<br>Mrs. R. D. Indrani Somasiri |
| *Typist* | — | Mrs. W. J. M. .D. M. A. Dias |

**Engineering Unit**

| | | |
|---|---|---|
| *Resident Engineer* | — | L. U. Jayawardene, Dip(C.Eng.) T |
| *Works Superintendent* | — | K. N. A. S. Perera, Dip. (Mech. Eng.) T |
| *Foreman (Electrical)* | — | M. D. Bernard Praxidus |
| *Foreman (Mechanical)* | — | M. J. M. D. S. Jayawardene |
| *Foreman (Building)* | — | R. M. Dayaratne |
| *Draughtsman* | — | Mrs. R. M. S. Ratnayake |
| *Clerk/Typists* | — | Mrs. K. A. P. Chandani<br>P. Premaratna Fernando, B.A. |

**Estate Management Division**

| | | |
|---|---|---|
| *Manager (Estates)* | — | P. S. Liyanagama, B.Sc Agric. |
| *Assistant Manager (Farm)* | — | K. P. de Silva |
| *Clerk/Typists* | — | N. R. Ayagama<br>W. P. R. Fernando |
| *Clerk/Typist (English)* | — | Miss K. A. D. S. Marian |
| *Field Assistant* | — | P. P. Jayasundara |

**Bandirippuwa Estate**

| | | |
|---|---|---|
| *Superintendent* | — | A. N. Ekneligoda |
| *Field Officer* | — | T. H. L. Peiris |
| *Field Assistant* | — | W. L. B. Silva |
| *Field Assistant (Nursery)* | — | B. A. L. Mendis |
| *Field Assistant (Dairy)* | — | J. M. S. N. Appuhamy |
| *Supervisors* | — | M. Chandrasoma<br>H. H. D. B. K. Dissanayake<br>U. C. Hettiarachchi<br>T. H. M. D. P. Peiris |
| *Clerk/Typist* | — | H. H. J. E. Appuhamy |

**Kirimatiyana Estate**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | K. P. C. Fernando |

**Pothukulama Research Station**

| | | |
|---|---|---|
| *Superintendent* | — | G. Vithanage |
| *Field Officer* | — | N. Gamage |
| *Supervisor* | — | M. J. David |
| *Estate Clerk* | — | J. A. Rexi Reginold |

**Ratmalagara Estate**

| | | |
|---|---|---|
| *Superintendnent* | — | M. R. L. A. Perera |
| *Field Officer* | — | D. L.J.Nettasinghe |
| *Field Assistant* | — | E. W. A. G. Gunasinghe |
| *Supervisor* | — | I. A. N. Hemasiri |
| *Estate Clerk* | — | B. L. Senagohosha |

**Walpita Estate**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | M. S. Perera |

**Makandura Seed Garden**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | J. I. Jayalath |
| *Supervisor* | — | W. M. Rathnayake |

**Maduruoya Seed Garden**

| | | |
|---|---|---|
| *Superintendent* | — | S. M. Wijerathna Banda |
| *Supervisor* | — | T. M. Keerthirathna |

**Passekudah Research and Development Farm**

| | | |
|---|---|---|
| *Assistant Manager (Farms)* | — | A. Thavaratnarajah |

**Minneriya Research and Development Farm**

| | | |
|---|---|---|
| *Officer-in-Charge* | — | M. P. W. Fernando |

# REPORT OF THE CHAIRMAN

D. V. Liyanage, Ph.D.

## 1 Soil Moisture Conservation

Coconut production in Sri Lanka in 1987 was 2,291 million nuts, a drop of 11% compared to the average production of 2,563 million nuts per year for the four years 1983 to 1986. The decline could be attributed largely to soil moisture stress caused by the low rainfall (1,497 mm) in 1987 together with the prolonged drought (2.86 months) in 1986.

The decline in production could be reduced if soil moisture conservation practices are adopted in coconut holdings and irrigation is resorted to, wherever applicable. The Coconut Research Institute has earlier demonstrated the value of husk burying in coconut lands and certain other cultural practices to conserve soil moisture. In areas where husks are not available, coir dust could be used instead. Irrigation with 375 litres of water once a week at the base of the palm, during periods of drought has increased copra production by 54%.

Droughts in the intermediate zone, where 51% of the coconut acreage lies, are a recurrent feature. Their frequency and duration are increasing each year. Consequently, priority should be given in the national coconut development programme to implement measures to conserve moisture in the soil and irrigate coconut lands. Then the annual coconut production could be maintained at a reasonable level to satisfy the demands of the industry and domestic consumption.

Research in progress at the Coconut Research Institute, has given priority to studies on reducing the adverse effects of drought on coconut production. They include breeding varieties for drought tolerance, identification of palms from existing populations that tolerate drought through embryo culture techniques and systems of organic farming that contribute towards increased water-holding capacity in the soil.

## 2 The Five-year Research Programme

The five-year research programme initiated in mid 1984 has given considerable data on the value of organic farming to increase the water-holding capacity of the soil. The first phase was to determine suitable leguminous creeping and bush covers that grow under coconuts in the different agro-ecological zones. This study was completed in the current year and some species of plants have been selected (see the Director's report for details). Management and associate problems relating to the selected species are to be studied in 1988.

Amongst the plants that have been selected is one that the farmers are familiar with and grows well in the intermediate and wet zones-*Gliricidia*. Periodical lopping of branches of gliricidia produced dry material amounting to about 14,000 kg/ha/yr, which is a cheap source of organic manure for coconut.

It is possible that leaf loppings of gliricidia could provide all the nitrogen and a part of phosphate and potassium requirements of the coconut palm. It also improves the physical and biological properties of the soil, eventually leading to better nutrition of the palm.

Both creeping covers and bush covers demonstrated their ability to enhance the water-holding capacity of the soil.

Another aspect of organic farming being studied is integrating animal husbandry with coconut cultivation for the small holders.

The advantages of organic farming are a more stable production of nuts year after year and a reduction in the cost of production of coconut.

Studies on the determination of fertilizer requirements of adult palms through leaf analyses indicated that the main nutritional problems in coconut were associated with excess/deficiency of potassium and magnesium.

Results from the biological control programmes on the coconut caterpillar and the black beetle have been disappointing. Release of parasitoids to control the spread of the coconut caterpillar during an epidemic stage was of little value. Introduction of a fungus and a virus to the breeding sites of the black beetle had limited success: the larvae were killed within the site, but the organisms did not spread effectively to other breeding sites.

Other studies in the five-year programme include production of improved coconut varieties, tissue culture, plant physiology, nutrition and crop protection.

### 3 Training and Extension

Training of the staff of the Board is vital for the efficient management and production of results. Three members of the research staff are undergoing post-graduate studies overseas and 15 others have participated in workshops, etc. abroad during the year.

The Coconut Research Board, quite correctly, emphasizes regularly the necessity of passing on the technology developed by the Institute to the growers. Otherwise research would be a sterile exercise. This aspect is limited by the fact that extension activities are not managed by us. We train the extension officers of the Coconut Cultivation Board, who in turn are expected to pass on the technology to the growers. The training includes instruction classes, field visits, periodical seminars and provision of publications.

Indeed, it is pleasing to note that the Ministry of Coconut Industries has asked the Board to take over the extension services to coconut estates of 50 ac and above in extent from January 1988. That will give an opportunity to the research workers to meet an important sector of the coconut growers, understand their problems and find solutions. It will be a two-way dialogue, beneficial to the grower as well as to the researcher.

## 4 Problems faced by the Board

There are two major problems faced by the Board that retard the progress of research: regional research stations and emoluments of the staff.

Regional research stations are required urgently in the Puttalam, Kurunegala and Matara areas to conduct field trials on problems specific to those areas, eg. testing coconut varieties that are being developed, planting systems, management problems, intercropping with tree crops etc.

Emoluments of the staff of the Coconut Research Institute were less than those at the other two commodity research institutes in the country. Proposals to increase the salaries were considered by the authorities for over two years, and when finally approved in December 1987, became obsolete with the introduction of new salary scales for the government service. It is necessary to increase the salaries of CRI staff urgently to bring them in line with the Government service.

## 5 The Coconut Research Board

The membership and attendance at meetings of the Coconut Research Board are given below :

| | | |
|---|---|---|
| Dr. D. V. Liyanage | (*Chairman*) | (attendance 11/11) |
| Mr. K. F. J. Perera | | (attendance 9/11) |
| Mr. Naomal S. Dias | | (attendance 11/11) |
| Mr. P. R. Wijewardene | | (attendance 7/11) |
| Mr. Merle E. Dalpathado | | (attendance 6/11) |
| Mr. G. P. P. N. Perera | | (attendance 7/11) |
| Dr. R. T. Wijewantha | | (attendance 8/11) |
| Mr. R. I. Fernandopulle | (*Observer*) | (attendance 10/11) |
| Mr. M. A. Warnakulasooriya | (*Ministry Representative*) | (attendance 10/11) |

Altogether the Board held 11 meetings during the year. With the exception of the 186th meeting (April), which was held at the Isolated Seed Garden, Ambakele, the meetings were held at the Coconut Research Institute, Lunuwila.

The Board appointed the following Consultants:

| | | |
|---|---|---|
| Mr. T. K. G. Ranasinghe | — | Processing Research |
| Mr. A. S. Ranatunga | — | Farming Systems Research |
| Dr. (Mrs.) Abeynaike | — | Mycorrhiza |

## 6 Committees of the Coconut Research Board

### 6.1 Research Committee

The Research Committee held three meetings to monitor and review the implementation of the research programme and to identify new areas of research. The Committee continued to provide very valuable assistance to the research staff in the conduct of their programmes.

The membership and attendnace at the meetings are given below :

| | | |
|---|---|---|
| Dr. D. V. Liyanage | (*Chairman*) | (attendance 3/3) |
| Mr. P. R. Wijewardene | | (attendance 3/3) |
| Mr. W. K. D. J. Waragoda | | (attendance 2/3) |
| Mr. B. R. T. de Tissera | | (attendance 2/3) |
| Dr. R. T. Wijewantha | | (attendance 2/3) |
| Dr. D. T. Wettasinghe | | (attendance 2/3) |
| Dr. R. Mahindapala | (*Convenor*) | (attendance 2/3) |

### 6.2 Administrative Committee

The Administrative Committee met three times to consider matters referred to it by the Board.

The membership and attendance at the meetings are given below :

| | | |
|---|---|---|
| Mr. K. F. J. Perera | (*Chairman*) | (attendance 3/3) |
| Mr. Naomal S. Dias | | (attendance 3/3) |
| Dr. D. T. Wettasinghe | | (attendnace 3/3) |
| Mr. M. A. Warnakulasooriya | | (attendance 3/3) |
| Mr. D. N. B. Perera | (*Convernor*) | (attendance 3/3) |

### 6.3 Estates Committee

The Estates Committee met twice during the year. The Committee introduced improved data recording systems and cost control methods, thereby reducing appreciably the Cost of Production on a number of estates.

The membership and attendance at the meetings are given below :

| | | |
|---|---|---|
| Mr. Naomal S. Dias | (*Chairman*) | (attendance 2/2) |
| Mr. G. P. P. N. Perera | | (attendance 2/2) |
| Dr. D. T. Wettasinghe | | (attendnace 2/2) |
| Mr. A. R. W. Jayasekera | | (attendance 1/2) |
| Dr. R. Mahindapala | | (attendance 2/2) |
| Mr. P. S. Liyanagama | (*Convenor*) | (attendance 2/2) |

# REPORT OF THE ACTING DIRECTOR

R. Mahindapala, Ph.D.

## 1. GENERAL

The progress of the implementation of the research programme was very satisfactory. Nearly 100 experiments were in progress at the end of the year. The industry was given several new recommendations arising out of the research findings. Usually, the growers take time to adopt new recommendations. The awareness of the growers to some of the new recommendations such as planting densities was obvious, and much effort was necessary to educate the extension personnel and growers on the new recommendations and to wean them from the traditional methods. Our efforts in this direction appear to have results.

Most of the field experiments were conducted satisfactorily. Majority of these experiments are in estates belonging to the Janatha Estates Development Board. The Institute staff continued to work in close cooperation with the staff of the JEDB in the conduct of these experiments.

The Institute purchased microcomputers to facilitate handling of accounts, stores and allied areas. Arrangements were made to train several staff members on the use of software.

Research projects funded by foreign agencies continued their progress satisfactorily.

Dr. D. T. Wettasinghe, Director, resigned the post with effect from 1 December to take up the position of Executive Secretary of the newly-formed Council for Agricultural Research Policy.

Dr. D. V. Liyanage, Chairman of the Coconut Research Board was honoured on the independence day with the much-coveted 'Vidya Nidhi' (first class) award by His Excellency the President in recognition of his contributions to coconut research.

Ninety employees of the CRI, who have completed 25 years of service, were honoured by the Board.

### 1.1 Agronomy Division

Research projects on soil moisture conservation, rehabilitation of low yielding plantations, establishment and management of replantings/new plantings and farming systems continued satisfactorily. At the end of the year, 28 experiments were in progress.

Covercropping trials in different agro-ecological zones indicated a considerable variation of the performance of cover crops. In the Wet Zone, *Pueraria phaseoloides*, *Centrosema pubescens* and *Calopogonium mucunoides* performed well, producing top dry matter yields of 12,000 to 13,000 kg/ha while in the Wet Intermediate Zone, these

cover crops produced top dry matter yields of 10,200 - 12,800 kg/ha. *P. phaseoloides, C. pubescens, Macroptilium atropurpureum, C. mucunoides* and *C. caeruleum* produced satisfactory top dry matter yields of 11,000 to 12,500 kg/ha in the Dry Intermediate Zone. *C. pubescens* and *M. atropurpureum,* which performed poorly in the Wet Zone, produced the highest top dry matter yields of around 13,700 kg/ha in the Dry Zone.

Bush covers gliricidia and ipil-ipil produced top dry matter yields of about 14,000 kg/ha at all sites. However, gliricidia performed better than ipil ipil in lateritic soils in the Wet Intermediate Zones. Also, gliricidia performed better than ipil ipil as a green manure crop in the Wet Intermediate Zone, and gives much promise as a source of cheap organic manure for coconut.

The creeping cover crops also demonstrated their ability to enhance the water-holding capacity of the soil. Although the soil moisture level in lands with the bush covers, gliricidia and ipil ipil was lower than that in lands with creeping covers, it was yet higher than in plots with no cover.

In the cover crop/fertilizer trial to determine the optimum requirement of N, P, K and Mg levels of *Pueraria phaseoloides,* the fertilizer mixture containing 35 kg N, 80 kg $P_2O_5$, 60 kg $K_2O$ and 25 kg Mgo when applied on the cover continued to produce the highest dry matter yields of 16,120 kg/ha this year too.

In sandy soil and lateritic soil in the intermediate zone, ploughing to a depth of 25 cm not only increased the soil moisture content by about 10% but also improved the physical structure of the soil.

Trials on moisture conservation demonstrated the possibility of using coir dust instead of husks in husk pits 8′×4′×3′. In lateritic soils, palms treated with 8′×4′×3 husk pits and linear trenches filled with husk and coir dust gave better yields than the control, while in sandy soil, similar pits filled with a mixture of coir dust and husk and single pits of 4′×4′×3′ filled with husk produced a better response over the control.

Trials on rehabilitation of low yielding plantations continued to demonstrate the increase in nut yields and copra in palms where quarter circle trenches around the palms were established and filled with green manure.

In the coconut/cattle/pasture and tree fodder system there was a general improvement in coconut production as a result of the addition of cow dung and application of gliricidia and ipil ipil green matter as a mulch to the palms. Cattle also benefited from this integrated system showing a live weight gain of around 300 g/head/day.

Ipil ipil performed better in the double row system of planting than a single row system as an intercrop and demonstrated its value as a source of fuelwood.

The intercropping trials conducted in the Wet Zone continued to clearly demonstrate that intercropping with perennials such as coffee, cocoa, cinnamon, clove/banana mixture and annual crops in rotation significantly increases the coconut yield compared with coconut grown as a monocrop.

The fertilizer trials with cacao showed that moderate levels of N and K provide a significant effect on the growth of cacao while ½ the normal dose of fertilizer would be sufficient to produce satisfactory bean yields.

Field surveys of coconut small holders conducted in the Wet Intermediate Zone under the farming systems programme identified several constraints, for intercropping which included low cash income, inadequate supply of planting material incidence of drought, inadequate extension support, problems associated with leasing of land, marketing and theft of harvested products.

### 1.2 Genetics and Plant Breeding Division

The breeding programme made good progress during the year. Although the collaborative research project with the University of Reading did not receive further funding by the Overseas Development Administration of the British government, the continued efforts of the CRI, University of Reading and the Staistics Department of the University of Colombo ensured steady progress in the studies undertaken and several publications are underway.

The trials for the evaluation of five improved cultivars at five different locations were maintained satisfactorily and palms at two sites have begun flowering. The hybrid CRIC 65 continue to be more vigorous than the talls but are more susceptible to black beetle attack. There were clear differences in performance from site to site but no variety-site interaction was observed.

Methods for the identification of phenotypically superior palms were investigated further and the results were encouraging. The selected palms had been crossed in various combinations to study genotypic effects and progeny trials established in different agroclimatic regions were brought upto six this year. Signs of hybrid vigour were again noted in these trials with *dwarf green* x *San Ramon, dwarf green* x *Sri Lanka tall* and *Sri Lanka tall* x *dwarf green* seedlings achieving splitting of leaves first, closely followed by *Sri Lanka tall* x *San Ramon. Sri Lanka tall* x *Sri Lanka tall* took a longer period for splitting of leaves.

The crossing programme for producing 12 different types of crosses was discontinued and the programme for production of "*Ambakele super*" material for the seed garden intensified. The selfing of dwarf palms and *San Ramon* crosses were continued and backcrossing of *dwarf green* and crosses with *spicata* were also carried out.

Work on gemplasm survey, collection and evaluation made satisfactory progress. The *dwarf* palms in the crop museum are now yielding fruit while seven indigenous *tall* forms have been purified and planted in blocks. Field gene banks for *San Ramon* and *dwarf* forms have been established and the programme for purification of exotic *dwarf* forms from the Ivory Coast is in progress. Biased collections from Moorock and Pitiakanda Estates showed the presence of special characteristics in these accessions. Collections were also made of several local forms of *tall* from the Southern Province and of *San Ramon* from Clovis Estate (North Western Province).

Miscellaneous studies included study of fruit components of different varieties, flowering and cropping patterns in *dwarf* palms and variation in nut numbers and nut weights, all of which yielded promising results of immense practical value. Studies were also begun on transmission of colour in coconut crosses and of round and oblong nuts and their fibre content.

The survey for assessment of performance of improved cultivars (CRIC 60 and CRIC 65) on a plantation scale was completed and the data are being processed. Although CRIC 65 had the advantages of early flowering and heavy bearing, the general consensus of opinion was that this cultivar was unsatisfactory as it is vulnerable to drought. However, under ideal conditions, it performs extremely well. The experience with CRIC 60 was less extensive but this cultivar seemed more satisfactory.

The total crop at the Isolated Seed Garden (ISG), amounting to 760,943, showed a 10% reduction from the crop of 1986 but was still higher than the 10-year average. Separate crop data for *tall* and *dwarf* palms confirmed the different response of the two varieties to changes in weather. While the crop from *tall* palms had decreased by 19%, that from *dwarf* had actually increased by as much as 40%, even though the numbers of dwarf palms in bearing had decreased. The mean numbers of nuts per palm for *tall* and *dwarf* were 80 and 50 respectively.

At the seed garden, a total of 450,248 CRIC 60 seednuts were produced. Of the production of *dwarf* x *tall* (CRIC 65) seednuts, only 73,278 were utilized. Completion of the replanting programme was delayed due to adverse weather conditions. The in-filling programme was continued but it was exceptionally difficult to establish the dwarf seedlings on field no. 9. The irrigation system could not be used fully due to recurring problems of some of the pumps.

The number of seednuts supplied during the year was 1.74 million, of which 29% were from the ISG. The decrease in crop at ISG from mid year onwards caused considerable difficulty in meeting the demand towards the end of the year. The continuing downward trend in crops island-wide is likely to cause a severe shortfall in 1988.

Based on recent research findings, it was decided to use all nuts harvested from plus palms and palms in seed gardens as seednuts without any selection. This will come into operation in January, 1988.

There was a decline in demand for pollen from the state-owned plantations and no requests at all from private estates.

Research activities at Ambakele nursery were reduced to a minimum with laying limited to requirements of the seed garden only. The bulk of nuts from the pollination programme and all nuts from germplasm collections were laid at the research nursery at Bandirippuwa Estate.

### 1.3 Soils and Plant Nutrition Division

Research projects on nutrient requirements of coconut and on improvement of soil organic matter status continued. Ten long term experiments progressed satisfactorily.

A long-felt need to obtain some basic data on irrigation of coconut was fulfilled when field studies were initiated at Marandawila Farm to study the effect of frequency and rate of drip irrigation on the soil-plant-water relations and productivity of coconut. Sand culture studies were also initiated to study the size of the irrigation zone on the growth and water relations of coconut seedlings and their nutrient balance.

During the year, studies were commenced on Vascular Arbuscular Mycorrhizae (VAM), an aspect which has hitherto received very little attention. Some mycorrhizae fungi were detected in association with coconut roots, and studies were commenced to elucidate the role of VAM on the growth of coconut and uptake of phosphorus from Eppawala Rock Phosphate (ERP).

Nut water analysis was used in some investigations to monitor changes in the concentration of nutrients, particularly Na, K, Ca, Mg and Cl, to differential treatments. Results were found to be comparable with those from leaf analysis. Sampling and analysis will be continued for confirmation of the results.

The joint FAO/CRI/CCB study on increasing yields of small holdings by use of fertilizer was reviewed with the appointment of a Coordinator by the FAO to commence the activities of phase II of the project. A local consultant was appointed by the FAO to evaluate and report on the progress of the project so far.

Studies on the determination of fertilizer requirements of adult palms through leaf analysis progressed satisfactorily. These investigations have indicated that the primary sources of deficiency or excess are K and Mg. These two elements appear to be the basis of most of the nutritional problems in coconut. For the first time, micro-element analysis have commenced on advisory samples.

The extensive refurbishing and rewiring of the Soils laboratories resulted in delays in executing the analytical programme during the year. However, this work has improved the working conditions of the laboratories.

### 1.4 Crop Protection Division

The collaborative research programmes between the Coconut Research Institute and the Silwood Centre for Pest Management (SCPM) of the Imperial College, London and with the Overseas Development and Natural Resources Institute (ODNRI), London, funded by the Commission of European Communities were concluded in December. The project activities were carried out satisfactorily, and it is hoped that the project with the SCPM could be extended in due course.

The project work mainly included basic studies on population dynamics of the coconut caterpillar and to evolve an integrated pest management programme. Several scientists from SCPM and ODNRI visited the CRI during the year to discuss various aspects of the project and to carry out some of the field studies in Sri Lanka. Dr. P. A. C. R. Perera successfully completed a doctoral thesis for the University of London on "Studies on *Opisina arenosella* and its natural enemies in Sri Lanka."

The project was able to analyse the host/parasite population data collected in Sri Lanka for the past 20 years and also to review the biological control programme in progress. The studies revealed that several factors such as low temperatures and low palm resistance, probably caused by nutritional deficiency, contribute to pest outbreaks. Outbreak cycles of the pest were linked with parasitoid numbers, temperature and rainfall. The release of laboratory-reared parasitoids did not appear to exert any control, and the programme of mass-rearing and release of parasitoids could no longer be justified.

Preliminary experiments carried out at the CRI using potted seedlings revealed that caterpillars survived and developed better in seedlings grown with nutrients free from potassium than in seedlings supplied with all nutrients. However, analysis of coconut leaf samples from healthy and caterpillar infested areas did not show a significant difference in potassium content.

Field observations indicated the heavy predation of eggs *Opisina arenosella* by the ant, *Monomorium floricola*. Further work on this aspect was planned.

At the ODNRI, several components of the sex pheromones of the coconut caterpillar were isolated and synthesized. Various combinations of these chemicals were field-tested in Sri Lanka, but none of the mixtures elicited any significant activity from the field populations of moths of *O. arenosella*. This project was therefore terminated.

Further studies on parasitoids of the coconut caterpillar were continued. No recoveries were made of *Antrocephalus pandens*, which was introduced from India in 1982, mass-reared and regularly released in the field. The parasitoid does not appear to be successful. Two parasitoids, *Elasmus nephantidis* and *Brachymeria nosatoi* were imported from India. They were mass-reared and released on a limited scale under observation to study their establishment and efficiency.

In experiments conducted in field cages, parasitism by *Eriborus trochanteratus* increased with increasing host density upto a maximum of 80 caterpillars/cage but decreased thereafter. In field studies carried out in a caterpillar-infested plantation, the larval parasitoid *Goniozus nephantidis* exhibited its searching ability only at very high host density.

Large scale field evaluation of trunk injection of monocrotophos using electric drills was continued. About 7,000 palms severely infested with the coconut caterpillar in estates and holdings in Kurunegala, Madampe, Anuradhapura and Ambalantota were treated. The caterpillar infestations in all these plantations were brought under satisfactory contol by this treatment, which can now be used as a routine control method.

Pesticide residue analysis using Thin Layer Chromatography (TLC) carried out with samples of nut water collected from palms seven days after treatment with monocrotophos by trunk injection revealed that the insecticide residue levels were below the tolerance level (0.02 ppm) established by the FAO/WHO. However, more accurate analysis using Gas Liquid Chromatography is required before any conclusions are made.

Studies on pesticide residues in kernel and nut water from palms treated with monocrotophos by bioassay with *Drosophila* sp indicated that the mortality of the adult flies in the treated and untreated samples was very low and similar, indicating that the levels of insecticide in the edible parts were below detectable limits.

In studies on the control of *Oryctes rhinoceros*, application of insecticides in the leaf axils of young palms at two-monthly intervals did not result in the reduction of damage to fronds.

Laboratory studies on the effect of temperature on the growth of 10 strains of *Metarhizium anisopliae*, a mycopathogen of *O. rhinoceros*, revealed that all the strains grew best at 30°C. However, the growth rates varied amongst the strains.

Field studies showed promise in the use of *M. anisopliae* in impregnation boxes in the control of *O. rhinoceros*. Adult beetles were attracted to the boxes, where eggs were laid. The resultant larvae were killed by the fungus, which spread to the untreated boxes about 10 m away.

In the investigations carried out at the Institute for Horticultural Research in England, Mycoplasma-Like-Organisms (MLO) were not detected in coconut tissue collected from palms showing symptoms of Leaf Scorch Decline and tapering.

Laboratory studies on the red weevil indicated that a ratio of male: female at 1 : 1 was adequate for the mass-rearing programme. The fecundity, hatchability and the duration of oviposition increased with the increase in number of matings of red weevil. Single mating was adequate for egg laying for about four weeks while 15 to 20 matings prolonged the egg laying for about three months.

The insecticides, monocrotophos and methamidophos when applied through trunk injection and root feeding, caused highest mortality of red weevil larvae at the end of one week after treatment. In bioassay experiments where petiole pieces from treated palms were fed to larvae, the insecticide residues were found to decrease gradually with time.

Several infestations of *Opisina arenosella* were recorded from Southern, Eastern North Western, North Central, Western and Central provinces. In these instances, laboratory-reared parasitoids were released depending on the severity of the pest infestation.

*Heteropsylla cubana* (Psyllidae) was recorded from *Leucaena leucocephala* which is grown in coconut plantations as a bush cover. The newly developing vegetative and reproductive shoots were severely damaged by this pest.

Two insect parasitic nematodes were screened against red weevil and black beetle. *Steinernema bibionis* parasitized and killed larvae of black beetle while *Heterorhabditis heliothidis* infected and killed red weevil adults.

The Institute continued to provide assistance to the Sri Lanka State Plantations Corporation (SLSPC) for the introduction of the oil palm pollinating weevil, *Elaedobius kamerunicus*. Within a month of the receipt of the approval of the Chief Plant Quarantine Officer for the field release of the insect, nearly 50,000 laboratory-reared insects were released at all oil palm plantations of the SLSPC. The insect established very well and started pollinating in all these plantations, and it was possible to terminate the manual pollination programme in these estates, thereby saving over Rs. 1 million during the year.

### 1.5 Coconut Processing Research Division

The research activities of the division were confined to the ongoing projects in fibre and on fuel saving techniques for copra drying.

Further work on fuel saving techniques for copra drying indicated the possibility of reducing the number of fires and shells required. Based on the preliminary trials, a further set of trials using 80% of the shells used in the normal method yielded copra with about 9% moisture after three firing cycles.

A prototype solar drier for the small holder was fabricated. The assistance of the Overseas Development and Natural Resources Institute (ODNRI) of England was sought to test this and other possible types of solar driers.

In work on improvements to sundrying mattress fibre, a black surface was found to be more efficient in drying fibre than the traditional coir dust bed.

### 1.6 Tissue Culture Unit

Experiments on vegetative propagation of coconut through *in vitro* culture of the immature embryo, the floral meristem and the tender leaf explant were continued. Techniques have been developed to produce highly embryogenic callus tissues from the immature embryo explant. The leaf culture medium was refined to induce rapid somatic embryogenesis. However, germination of the embryoids derived from leaf was sporadic. Some embryoids developed callus tissues. The floral meristems produced callus with occasional rooting.

The investigation on *in vitro* selection of stress tolerant coconut germplasm using polyethylene glycol (PEG) and sodium chloride in culture media was continued. Nearly 1000 coconut embryos extracted from randomly selected nuts were subjected to stress conditions. Seedlings could not be recovered from the embryos cultured in media stressed with PEG. About 12— of the embryos cultured in the medium stressed with 290 mmol NaCl developed into seedlings and 50% of these withered complete on transfer to 320 mmol NaCl. In the non-stressed control medium, 58% of the seedlings developed. Investigations are in progress to determine the maximum PEG and NaCl levels at which the putatively drought tolerant coconuts will survive.

### 1.7 Plant Physiology Unit

Physiological studies on 'putative' drought tolerant palms at the Isolated Seed Garden indicated their slightly higher water requirement and their ability to extract water at low water potentials, compared with the ordinary *typica* variety.

Analysis of data from palms affected with Leaf Scorch Decline (LSD) did not reveal any evidence of heritability of LSD.

Studies on the identification of physiological and biochemical characters of drought tolerant and high yielding *nana* palms were commenced.

### 1.8 Biometry Unit

The Unit continued to assist the Research Divisions in designing field experiments, analyses and interpretation of data. Nearly 440 sets of data were analysed during the year.

In the calibration trial at Walpita Estate, the number of bunches per palm produced in 1987 was similar to that in 1986. However, the number of nuts per hectare recorded an overall decrease of 8.6% over 1986, while copra yield per hectare was reduced by 30.7%. This is partly due to the considerable reduction of the weight of husked nut from 670 g/nut in 1986 to 620 g/nut in 1987.

The three agri-meteorological stations at Bandirippuwa Estate, Ratmalagara Estate and Isolated Seed Garden were maintained satisfactorily. At all the stations, the total rainfall during the second half of the year was more than double that of the rainfall for the first half.

### 1.9 Estates Management Division

The Division managed five estates, two research and demonstration farms and two seed gardens.

The general condition of these properties continued to improve. Work of the estates was monitored closely by the introduction of improved data recording systems and cost control methods. Advance progammes for agricultural operations were drawn up and the monthly progress was closely monitored. Monthly cost sheets for each field operation were prepared in accordance with the progress made, which provided information on unit cost of each field operation.

Adoption of these practices had been quite successful in reducing the cost of production to around Rs. 1,000/- on a number of estates. At Walpita and Ratmalagara Estates, the actual cost of production was about 50% of the estimated cost of production. However, the agricultural standards were not lowered.

Soil and moisture conservation was given priority in view of the recurring droughts. Mulching was intensified. All available husks were buried in the estates in smaller individual pits at 5' from the bole. Coir dust was used as an alternative to husk when the latter was in short supply. Establishment of cover crops was intensively pursued. Incorporation of organic matter was encouraged as a further measure of soil and moisture conservation.

Ground conditions were satisfactorily maintained and the use of herbicide was introduced very effectively and economically in maintaining manure circles and roadways free of weeds.

The overall reduction in yield over the previous year was 16.3% which could be attributed to the drought in 1986. This yield, however, compares satisfactorily with the national production level. Notwithstanding the adverse weather conditions, Poththukulama Research Station recorded 17.0% increase in yield. This performance is attributed to the soil moisture conservation measures undertaken during the previous years.

Work on the establishment of Maduru Oya Seed Garden in Mahaweli System 'B' continued satisfactorily and another 20 ac were planted with material selected from the Isolated Seed Garden. Damage by wild elephants was reduced owing to the cultivation of surrounding lands and paddy fields.

The performance of the Makandura Seed Garden was very satisfactory and already a few seedlings have flowered within 3½ years of planting.

In several estates, emphasis was laid on improving poorly performing new clearing. Accordingly, underplantations in field Nos. 1 and 4 at Ratmalagara Estate and the newplanting in field No. 9 at the Poththukulama Research Station received special attention. Thirty eight acres of new plantings/replantings were established during the year.

The contract system introduced for gathering and transport of picked nuts has proved to be efficient in operation. The cost of this system is about 50 — 60% of that of employing check-roll labour. Also, the contract system has advantages such as the collection of maximum possible nuts, speedy collection of the pick and reduced nut loss at the pick .

The estate staff were given a training in techniques of nursery management in the production of polybagged seedlings. Excellent quality seedlings were produced at the Poththukulama Research Station and similar seedlings are being raised elsewhere.

### 1.10 Information Services Unit, Library and the Coconut Information Centre

One issue of *Pol Pawath* and two issues of *Coconut Bulletin* were published during the year. Another issue of *Pol Pawath* was with the printer at the end of the year. The demand for back-issues of *Pol Pawath* and *Coconut Bulletin* necessitated reprinting some of those issues.

Several advisory circulars in the new series were issued.

The Institute participated in the Mahapola seventh anniversary exhibition at Hinid uma, Agro-Mahaweli exhibition at Embilipitiya, Agro Mart exhibition in Colombo and Gam Udawa at Kataragama.

Advisory assistance was provided to a large number of coconut growers by way of field inspections and advice.

The Library functioned smoothly during the year. In addition to serving the CRI staff, it provided assistance to the inter-library loan service and AGRINET service. The number of books at the end of the year was 4448.

The Coconut Information Centre continued its activities satisfactorily. The publications programme, information collection, storage, dissemination and microfiching of literature envisaged in phase II of the project with financial assistance from the International Development & Research Centre, Canada were all attended to as scheduled. A Retrospective Bibliographical Series on theses, an Annotated Bibliographical Series Nos. 16-17 covering the year 1983—1984 and four issues of the Newsletter were published. Two more publications are ready for printing in early 1988.

### 1.11 Administration Division

The total expenditure during the year was Rs. 29.6 million. The normal welfare activities were continued. Ninety employees who have served the CRI for 25 years or more were felicitated. The employer-employee relationship was cordially maintained.

Microcomputers were purchased for the Accounts Unit. A new building with all facilities including a workshop was constructed for the Engineering Unit. The construction programme of the Institute was severely affected by defaulting contractors and as a result, several building programmes had to be abandoned, either wholly or after partial construction.

## 2.2 FOREIGN-AIDED PROJECTS

### 2.1 Coconut Development Project

The Coconut Development Project terminated in June. During the first half of the year, an irrigation tank was constructed at Makandura Seed Garden. Electricity supply to Ratmalagara Estate, Makandura Seed Garden and Walpita Estate, partly funded by this Project, was completed.

The Institute received laboratory, field and other equipment worth over Rs. 5. million under the Project.

### 2.2 Other Projects

Other foreign-aided projects, namely the Coconut Information Centre (funded by the International Development & Research Centre, Canada), Tissue Culture Project (funded by the United States Agency for International Development), Biological control (funded by the European Economic Commission), agronomic projects (funded by the Canadian International Development Agency) and the Fertilizer project for small holders (funded by the Food & Agriculture Organization) progressed satisfactorily.

## 3. FIELD DAYS, SEMINARS

A well-attended seminar on coconut cultivation was held on 18 May at the Koggala Beach Hotel, Habaraduwa for coconut growers and extension personnel of the CCB in the Southern Province. The Hon. Harold Herat, Minister of Coconut Industries and G. V. S. de Silva Esqr., M. P. for Habaraduwa participated in this seminar. A field day was held in the afternoon at the Sirikandura Division of Monrovia State Plantation, Ratgama, where the participants were briefed on the opportunities for intercropping in coconut lands.

A seminar on "Quality Control of Coconut Products" was held at Lunuwila for planters from the Janatha Estates Development Board, National Livestock Development Board and Superintendents and extension personnel of the Coconut Cultivation Board. Several internal seminars on various technical matters were also held during the year.

The Institute personnel also participated in a number of seminars on coconut research and cultivation. The staff members continued to serve as resource persons for the Coconut Development Training Centre.

The Institute conducted a course of training for the Diploma Centre of the National Institute of Plantation Management. Attachment training programmes were provided to three batches of students from the National Apprenticeship Board, four F A O fellows from Pakistan and two F A O fellows from Vietnam.

Several short programmes were conducted for visitors/trainees from Sri Lanka and several other countries, including a team of officers from the Rubber Replanting Aid Fund, Thailand.

## 4. VISITORS

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

Mr. Peter S. Beevor, Overseas Development & Natural Resources Institute (ODNRI), London.
Mr. George Breag, Coconut Development Authority and ODNRI
Mr. M. E. Cammell, Imperial College at Silwood Park, London
Mr. H. C. Coote, ODNRI, London
Dr. Charles Godfray, Imperial College at Silwood Park, London
Mr. A. Govindan, American Embassy, New Delhi, India
Prof. Francis Halle, University of Montpellier, France
The Hon. Harold Herat, Minister of Coconut Industries
Mr. Lim S. Ho, Food & Agriculture Organization
Mr. K. Kawaguchi, FAO Representative, Colombo
Dr. J. D. Mumford, Imperial College at Silwood Park, London
Mr. B. Prunieres, Cultural Attache, French Embassy
Mr. B. Rajaratnam, ADB, Manila
Dr. B. B. Thapa, Resident Representative, UNDP, Colombo
Prof. M. J. Way, Silwood Centre for Pest Management, London
Mr. D. Wijesinghe, Secretary, Ministry of Coconut Industries

## 5. STAFF 'MATTERS

### 5.1 Overseas Training

Mrs. L. V. K. Liyanage, Head of the Agronomy Division, participated in a Workshop on management and improvement of *Gliricidia sepium*, held in Costa Rica from 21 to 27 June.

Mrs. Liyanage also participated in a Workshop on Multi-purpose Tree Species for Small Farm Use, held in Thailand from 1 to 5 November.

Mr. D. N. S. Fernando, Assistant Agronomist, participated in a Workshop on Multi-purpose Tree Species for Small Farm Use in arid and semi-arid tropics, held in Pakistan from 16 to 19 November.

Mr. H. A. J. Gunathilake, Assistant Agronomist, left the island on 22 April to undertake postgraduate studies at the University College of North Wales, U. K.

Mrs. W. M. U. Fernando, Assistant Plant Breeder, participated in a Coconut Breeding Course, held in Indonesia from 27 June to 13 July.

Mr. K. S. Jayasekera, Assistant Soil Scientist, attended a College on Soil Physics in Trieste, Italy from 2 to 20 November.

Mr. N. A. Tennakoon, Assistant Soil Scientist, attended a Fellowship Programme on Fertilizer and Compost Techniques held in Ghent, Belgium from 1 September to 15 October.

Dr. P. A. C. R. Perera, Crop Protection Officer, returned to the Island on 19 February after successfully completing a Ph.D. programme at the University of London, U. K.

Mrs. S. M. Karunaratne, Officer-in-Charge of the Tissue Culture Unit, attended a Workshop on Recent Advances in Plant Tissue Culture held in September at the University of Bath, England.

Mr. T. S. G. Peiris, Biometrician, attended a six-month training course in Applied Statistics and Statistical Computing at the University of Reading, U. K. from January. He followed this training with visits to other Institutes.

Mr. M. J. C. Perera, Project Leader of the Coconut Information Centre, attended a training course on the Use of Mini-Micro CDS/ISIS for Information Management, held in Thailand from 19 to 31 January.

Miss T. I. I. Peiris, Library Assistant, attended a training programme on Library Automation held in Malaysia from 20 April to 23 May.

The following officers continued their postgraduate training :

Mr. K. R. R. A. Peiris, University of Queensland, Australia

Ms. M. B. M. N. Dias, University of Queensland, Australia.

## 5.2 Overseas visits

Dr. R. Mahindapala, Deputy Director (Research), undertook a familiarization visit to coconut research facilities in France and in the Ivory Coast from 6 to 27 November.

Mr. M. de S. Liyanage, Agronomist, undertook a study tour of the International Institute of Tropical Agriculture, Nigeria from 18 September to 18 October.

Dr. (Miss) M. R. T. Wickramaratne, Head of the Genetics & Plant Breeding Division, attended a meeting of the Working Group on Genetic Improvement (FAO) and Working Group on Palms (IBPGR) held in Manila, Philippines from 27 to 29 January. Afterwards, she visited several research centres in the Philippines.

Mrs. S. M. Karunaratne, Officer-in-Charge of the Tissue Culture Unit, participated in an Expert Consultation on the Use of Tissue Culture in Plant Quarantine for Exchange of Planting Materials, held in India from 26 February to 2 March.

## 5.3 Participation of CRI staff in other Statutory Bodies, Committees

The following CRI staff members served in the Boards/Committees as indicated below :

Dr. D. T. Wettasinghe :

- Member, Board of Governors, National Institute of Plantation Management
- Member, Board of Directors, Sri Lanka Cashew Corporation
- Member, Board of Management, Postgraduate Institute of Agriculture, University of Peradeniya
- Member, Working Committee on Agriculture and Veterinary Science, Natural Resources, Energy and Science Authority of Sri Lanka
- Member, Board of Study in Crop Science, Postgraduate Institute of Agriculture, University of Peradeniya

Dr. R. Mahindapala :

- Member, Fromulary Committee on Pesticides, Ministry of Agricultural Research & Development
- Member, Working Committee on Biological Sciences, Natural Resources, Energy and Science Authority of Sri Lanka
- Member, Drafting Committee on Pesticides, Sri Lanka Standards Institute
- Member, Special Committee for the import of Oil Palm, Ministry of Agricultural Research and Development

Mr. M. Jeganathan :

- Member, Fertilizer Coordinating Committee, National Fertilizer Secretariat
- Member, Agricultural Committee, Atomic Energy Authority
- Member, Technical Advisory Committee, Ceylon Fertilizer Corporation
- Member, Drafting Committee on Fertilizer, Sri Lanka Standards Institute

### 5.4 Awards and Presentations

Dr. D. V. Liyanage, Chairman of the Coconut Research Board was honoured with the 'Vidya Jyoti' (first class) award by H. E. the President.

Dr. R. Mahindapala, Deputy Director (Research) received the 'Ten Outstanding Young Persons Award' for Agricultural Research, by Jaycees.

Ninety employees were felicitated for employment of 25 years and more with the CRI.

## 6. PUBLICATIONS AND COMMUNICATIONS AT SCIENTIFIC MEETINGS

**Attanayaka, R. B. & W. M. U. Fernando** (1987)—Thembili. *Coconut Bulletin* 4(1); 26-27

**Cock, M. & P. A. C. R. Perera** (1987)—Biological control of *Opisina arenosella* Walker (Lep. Oecophoridae). *Biological Control News & Information* 8; 283-310

**Fernando, L. C. P. & P. Kanagaratnam** (1987)—New records of some pests of the coconut inflorescence and developing fruit and their natural enemies in Sri Lanka. COCOS 5; 39-42

**Fernando, W. M. U.** (1987—San Ramon. *Coconut Bulletin* 4(1); 15

**Karunaratne, S. M.** (1987)—Tissue Culture towards better coconut. *Coconut Bulletin* 4(1); 6-11

**Liyanage, D. V.** (1987)—4000 hectares of coconut lost every year but the production per hectare is increasing. *Coconut Bulletin* 4(2); 13-14

**Liyanage, D. V., H. Luntungen & T. Mankey** (1987)—Coconut breeding in Indonesia -II. The yield potential of improved varieties of coconut. *COCOS* 5; 8-18

**Liyanage, L. V. K.** (1987)—Moisture conservation in coconut lands. *Coconut Bulletin* 4(2); 1-5

**Liyanage, L. V. K.** (1987)—Traditional use of gliricidia in Sri Lanka. *Nitrogen Fixing Tree Association Special Publication* 87-10; 92-94

**Liyanage, L. V. K. & A. M. U. Wijeratne** (1987)—Uses and management of *Gliricidia sepium* in coconut plantations in Sri Lanka. *Nitrogen Fixing Tree Association Special Publication* 87-01; 95-101

**Liyanage, L. V. K. & H. P. S. Jayasundere** (1987)—Potential for use of nitrogen fixing trees in coconut plantations. Paper presented at the Workshop on N-fixation and soil fertility at the Postgraduate Institute of Agriculture, Peradeniya, December, 1987

**Liyanage, L. V. K., H. P. S. Jayasundere & T. G. L. G. Gunasekera** (1987)—Potential uses of Nitrogen Fixing Trees in small coconut plantations in Sri Lanka. Poster presentation at the Workshop on Multi-purpose Tree Species for small farm use in Thailand, November, 1987

**Liyanage, M. de S. & H. P. S. Jayasundere** (1987)— Intercropping food legumes under coconut. *Proceedings of the seminar on Improved Production and Utilization of Food Legumes in Sri Lanka*, Peradeniya, 37-42

**Mahindapala, R.** (1987)— Coconut Seed Gardens in Sri Lanka. *Coconut Bulletin* 4(1); 12-14

**Mahindapala, R.** (1987)—Irrigation in coconut. *Coconut Bulletin* 4(2); 6-12

**Mahindapala, R.** (1987) Activities of the Coconut Research Institute. *Coconut Bulletin* 4(2); 26-32

**Mahindapala, R.** (1987)—Introduction of the oil palm pollinating weevil, *Elaedobiu kamerunicus* to Sri Lanka. Annual Sessions of the Sri Lanka Association for the Advancement of Science, December, 1987

**Padmasiri, M. F. L.** (1987)—Pollination. *Coconut Bulletin* 4(1); 28-30

**Pathirage, D. M. & H. P. H. Pathirana** (1987) The Isolated Seed Garden. *Coconut Bulletin* 4(1); 24-25

**Perera, P. A. C. R.** (1987) New technology in crop protection. *Coconut Bulletin* 4(2); 23-25

**Rajapakse, C. N. K., P. Kanagaratnam & P. K. K. Croos** (1987)— Studies on the reproductive biology of *Rhynchophorus ferrugineus*, the red palm weevil of coconut. Annual Sessions of the Sri Lanka Association for the Advancement of Science, December, 1987

**Samarasinghe, H.** (1987)—New techniques in pollen collection and processing. *Coconut Bulletin* 4(1); 31-32

**Somasiri, L. L. W.** (1987)— Fertilizer increases your coconut yield. *Coconut Bulletin* 4(2); 15-22

**Sossou, J., S. M. Karunaratne & A. Kovoor** (1987)—Collecting palm: *In vitro* explanting in the field. *FAO/IBPGR Plant Genetic Resources Newsletter* 69; 7-18

**Wickramaratne, M. R. T.** (1987) —More palms, more nuts, more copra. *Coconut Bulletin* 4(1); 1-5

**Wickramaratne, M. R. T.** (1987) Breeding coconut for adaptation to drought. *Coconut Bulletin* 4(1); 16-23

**Wickramaratne, M. R. T., R. Coe & S Fernando** (1987) Evaluation of criteria for selection of seed coconut (*Cocos nucifera* L.). *COCOS* 5; 1-7

## 7. ACKNOWLEDGEMENTS

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Overseas Development & Natural Resources Institute, London

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Natural Resources, Energy and Science Authority of Sri Lanka.

Canadian International Development Agency.

The International Development & Research Centre, Canada

The Asian Development Bank

International Fund for Agricultural Development

Food & Agriculture Organization

University of Reading, UK

The British Council & the Overseas Development Administration

The Australian High Commission and the Australian Development Assistance Bureau

The Agricultural Research Project funded by the World Bank

# REPORT OF THE AGRONOMY DIVISION

**Head—L. V. K. Liyanage, M.Sc.**

## 1. GENERAL

### 1.1 Staff matters

Mr. A. S. Ranatunga continued to serve as a consultant to assist the farming systems research programme of the division.

*Promotions :* The following officers were promoted :

Mrs. L. V. K. Liyanage from Executive Grade Class II to Class I with effect from 10 June.

Mr. M. de S. Liyanage from Executive Grade Class III to Class II with effect from 22 February.

Mrs. K. C. P. Perera from Technical Grade Class II to Class I with effect from 1 January, 1986.

Mr. A. A. D. N. Athauda from Clerical and Allied Grade Class II to Class I with effect from 1 January, 1985.

Mr. J. K. H. V. Perera from Minor Grade Class I to special Class with effect from 1 January, 1986.

### 1.2 Study Leave

Mr. H. A. J. Gunathilaka, Assistant Agronomist left the island on 23 April to undertake postgraduate studies in Crop Ecology at the University College of North Wales, Bangor, North Wales, United Kingdom. The training is sponsored by the Agriculture Research Project.

Mr. D. N. S. Fernando, Assistant Agronomist commenced the research project on "Root interactions of coconut and under-grown pastures" at the Institute for his postgraduate study programme.

## 2. RESEARCH PROJECTS

### PROJECT 1: STUDIES ON THE IMPROVEMENT OF SOIL ORGANIC MATTER STATUS AND WATER HOLDING CAPACITY.

In each of the following experiments 1.1.1 to 1.1.4 four plant samplings were done at three monthly intervals. Dry matter yields were recorded by removing 1 $m^2$ quadrat samples for creeping covers and cutting at 1 m height for tree covers. Soil samples upto 60 cm depths were taken from each plot at six-monthly intervals.

**Experiment 1.1.1 — Evaluation of creeping and bush covers for coconut lands with special emphasis on plant characters and the effect on physical and chemical properties of the soil at Bandirippuwa Estate, Lunuwila (Wet Intermediate Zone, Sandy soil)—1984.**

Among the creeping cover crops *Pueraria phaseoloides* produced the highest top dry matter yields of around 12,800 kg/ha followed by *Calopogonium mucunoides* around 11,600 kg/ha and *Centrosema pubescens* around 10,200 kg/ha during the year. Top dry matter yield of *Macroptilium atropurpureum* was 8300 kg/ha which was relatively low compared to the yield last year. The top dry matter yield from *Mucuna utilis* was 6100 kg/ha and was only about 60% of the yield of previous year. The bush covers ipil-ipil and gliricidia produced top dry matter yields of morethan 14,000 kg/ha during the year.

**Experiment 1.1.2 — Evaluation of creeping and bush covers for coconut lands with special emphasis on plant characters and the effect on physical and chemical properties of the soil at Walpita Estate, Kotadeniyawa (Wet Zone, Lateritic gravel soil)—1984.**

During the year, *P. phaseoloides* produced the highest top dry matter yields of around 13,000 kg/ha while both *C. pubescens* and *C. mucunoides* gave yields of around 12,000 kg/ha. Top dry matter yields of *M. utilis* and *M. atropurpureum* were around 6000 kg/ha. Both ipil-ipil and gliricidia produced top dry matter yields of more than 15,000 kg/ha.

**Experiment 1.1.3 — Evaluation 'of creeping and bush covers for coconut lands with special emphasis on plant characters and the effect on physical and chemical properties of the soil at Heemmaliagara Estate, Dummalasuriya (Dry Intermediate Zone) Lateritic gravel soil)—1984.**

During the year top dry matter yields of around 12,500 kg/ha were produced by *P. phaseoloides* and *C. pubescens*. Both *C. mucunoides* and *C. caeruleum* gave satisfactory yields of more than 11,000 kg/ha . Top dry matter yields of *M. atropurpureum* was 11,500 kg/ha. Performance of *M. mutilis* was poor during the year, giving a top dry matter yield of only 5010 kg/ha. Top dry matter yields of ipil-ipil and gliricidia were more than 15,000 kg/ha.

**Experiment 1.1.4 — Evaluation of creeping and bush covers for coconut lands with special emphasis on plant characters and the effect on physical and chemical properties of the soil at St. Johns Estate, Mangala-eliya (Dry Zone, Loamy sands)—1984.**

During the year, the highest top dry matter yield of around 13,700 kg/ha was obtained from *C. pubescens* and *M. atropurpureum*. *P. phaseoloides* and *C. mucunoides* had low yields of around 8000 kg/ha while *M. utilis* too produced relatively lower yields of around 6000 kg/ha. Both ipil-ipil and gliricidia produced top dry matter yields of more than 15,000 kg/ha.

*L. V. K. Liyanage and A. M. U. Wijeratne*

**Experiment 1.2 — Effect of N P K and Mg on the early growth and nutrient uptake of *Pueraria phaseoloides* grown under coconut, Ratmalagara Estate, Madampe —1984.**

The highest top dry matter yields of 16,120 kg/ha along with leaf litter yields of 12,000 kg/ha were produced with 35 kg N, 80 kg $P_2O_5$ 60 kg $K_2O$ and 25 kg MgO/ha However, higher K levels at the rate of 120 kg $K_2O$/ha in the presence of moderate levels of N, P and Mg (35 kg N, 40 kg $P_2O_5$ and 25 kg MgO/ha respectively) produced the largest quantity of leaf litter of around 14,000 kg/ha.

*L. V. K. Liyanage and A. M. U. Wijeratne*

**Experiment 1.3 — Effect of green manuring practices on the improvement of organic matter content and water holding capacity of soil. Muthugala Mahawatte Estate, Dambadeniya—1984.**

During the year two harvests of fresh green matter were obtained by lopping the trees at 1 m height on 3 June and 3 November. This year too, gliricidia performed better than ipil-ipil.

Along with fertilizer application of 3 kg of Adult Palm Mixture per palm in June, fresh green matter consisting of 19 kg gliricidia and 11 kg of ipil-ipil was incorporated to a depth of 22 cm around the manure circle. Only green matter was incorporated in no fertilizer plots. Fresh green material obtained in November was added to the manure circle as a mulch at the rate of 5 kg each of gliricidia and ipil-ipil.

Records on nut yield, copra weight, number of female flowers and immature nut fall were maintained. There were no significant differences in nut yields among the treatments.

*L. V. K. Liyanage, H. P. S. Jayasundera and M. Bastian*

**Experiment 1.6 — In each of the following experiments, 1.6.1 and 1.6.2, once a year and once in three years ploughing treatments ($F_1$ and $F_3$) were imposed in December. Soil measurements such as moisture, bulk density, temperature and porosity were taken during the dry periods, Records on nut yield, copra weight, number of female flowers and immature nut fall were maintained.**

**Experiment 1.6.1 — Effect of three frequencies and two depths of ploughing on the performance of coconut on sandy soil. Jacintha Estate, Palavi—1984.**

There were no significant differences in various components of the coconut yield among the treatments. However, the soil moisture content at 25 cm depth in ploughed plots was 10.2% more than that in the control plots. All the ploughed plots had a higher total porosity and a lower bulk density compared to controls.

*T. G. L. G. Gunasekera and M. J. I. Costa*

**Experiment 1.6.2 — Effect of three frequencies and two depths of ploughing on the performance of coconut on lateritic gravels soil. Heemmaliyagara Estate, Dummalasuriya. — 1984.**

There were no significant differences in various components of the coconut yield among the treatments. However, the soil moisture content at 25 cm depth in ploughed plots was 9.6% more than that in the control plots. All the ploughed plots had a higher porosity and a lower bulk density compared to the controls.

*T. G. L. G. Gunasekera and M. J. I. Costa*

**Experiment 1.9.1 — Effect of different methods of placement of husk and coir dust on moisture conservation in lateritic gravel soils. Kiniyama Estate, Bingiriya— 1984.**

During the year, records were maintained on nut yield, copra weight, number of bunches, female flowers and fallen immature nuts.

Treatments consisting of either 8′ x 4′3′ pits filled with husk or linear trenches filled with a mixture of husk and coir dust appeared to be more effective than the control. As in the previous year, the circular trenches caused a reduction of yield in palms compared with the control palms.

The experiment is in progress.

*M. de S. Liyanage*

**Experiment 1.9.2 — Effect of different methods of placement of husk and coir dust on moisture conservation in sandy soils. Jacintha Estate, Palavi— 1984.**

In this trial, palms treated with 8′ x 4′ x3′ pits filled with a mixture of husk and coir dust and those treated with single pits of 4′ x 4′ x 3′ filled with husk gave a better response in terms of both nut and copra yield than the control. Here again, the circular trenches continued to show an adverse effect on palms.

The experiment is in progress.

*M. de S. Liyanage*

**Experiment 1.10 — Effect of five different methods of management on the performance of ground covers and their effects on coconut production — 1987.**

Two experiments were set up to study the effects of different management practices on the performance of ground covers and their effect on coconut production in two soil types in two agroclimatic zones.

In these experiments, the following three cover crops will be tested under five different management systems.

Cover crops : 1. *Pueraria phaseoloides*
2. *Centrosema pubescens*
3. *Macroptilium atropurpureum*

Management systems :

1. Light harrowing once a year when the cover is thick.
2. Light harrowing twice a year when the cover is thick.
3. Plough-in the cover crop once in two years.
4. Mulching with the cover crop loppings.
5. Untreated cover crop.

Design : Randomized complete block design with three replicates.

Location : 1.10.1 Saddhatissa Estate, Divulapitiya (Wet Zone, Lateritic gravel soil)

1.10.2 Poththukulama Research Station , Pallama (Dry Zone, Sandy loam soil)

These experiments were commenced in October, 1987. The pre-experimental records on nut production, copra weight, stem girth at the top, number of fronds and female flowers were kept.

Establishment of cover crops in experiment 1.10.2 was completed in Maha season.

*H. P. S. Jayasundera, L. V. K. Liyanage, A. M. U. Wijeratne and R. Marasinghe*

## PROJECT 2: REHABILITATION OF LOW YIELDING PLANTATIONS

**Experiment 2.1 — Effect of various cultural practices on the performance of low yielding palms. Jacintha Estate, Palavi — 1984.**

This experiment was abandoned during the year due to the poor establishment of *Pueraria* on sandy soil.

*T. G. L. G. Gunasekara*

**Experiment 2.2.1 — Effect of cultural operations designed to induce root formation on the rehabilitation of low yielding plantations in lateritic gravel soils. Heemmaliyagara Estate, Dummalasuriya — 1984.**

During the year, records were maintained on the nut yield, copra weight, number of female flowers, bunches and immature nut fall. Plots with $\frac{1}{4}$-circle trench treatment showed an increase of 8.5% in number of nuts and 21.1% in copra content over other treatments (Table 1).

The experiment is in progress.

*T. G. L. G. Gunasekara and M. J. I Costa*

**Table 1**—*Coconut and copra production in different cultural operations at Heemmaliagara Estate Dummalasuriya (Experiment 2.2.1)*

| *Treatments* | *Coconut yield Nuts/palm* | *Copra weight Mt/ha* |
|---|---|---|
| $T_1$ | 43.6 | 1.03 |
| $T_2$ | 35.6 | 0.77 |
| $T_3$ | 40.6 | 0.85 |
| $T_4$ | 34.7 | 0.73 |
| $T_5$ | 37.5 | 0.85 |
| $T_6$ | 34.5 | 0.77 |
| $T_7$ | 30.8 | 0.66 |
| $T_8$ | 29.3 | 0.63 |
| $T_9$ | 33.5 | 0.68 |
| $T_{10}$ | 26.8 | 0.52 |
| $T_{11}$ | 40.2 | 0.85 |
| Sig. | *n.s.* | *n.s.* |
| LSD (P=0.05) | 10.31 | 0.321 |
| CV% | 20.85 | 24.85 |

$T_1$ =Opening up of $\frac{1}{4}$ circle trench and filled with Gliricidia leaves.

$T_2$ =Opening up of $\frac{1}{4}$ circle trench and filled with Goat dung.

$T_3$ =Opening up of $\frac{1}{4}$ circle trench and filled with Sandy soil.

$T_4$ =Opening up of $\frac{1}{2}$ circle trench and filled with Gliricidia leaves.

$T_5$ =Opening up of $\frac{1}{2}$ circle trench and filled with Goat dung.

$T_6$ =Opening up of $\frac{1}{2}$ circle trench and filled with Sandy soil.

$T_7$ =Opening up of full circle trench and filled with Gliricidia leaves.

$T_8$ =Opening up of full circle trench and filled with Goat dung.

$T_9$ =Opening up of full circle trench and filled with Sandy soil.

$T_{10}$=Opening up of full circle trench and filled with same soil.

$T_{11}$=Control.

**Experiment 2.2.2 — Effect of cultural operations designed to induce root formation on the rehabilitation of low yielding plantations in lateritic gravel soils. Puwakwatta Estate, Kotadeniyawa — 1984.**

Records on coconut yield, copra weight, number of female flowers and immature nut fall were maintained. Data indicated that there were significant differences in the number of nuts and copra weight among treatments (Table 2). Plots with $\frac{1}{4}$-circle trench treatment showed a higher number of nuts and a higher copra weight than other treatments.

*T. G. L. G. Gunasekera and M. J. I. Costa*

## PROJECT 3 : STUDIES ON THE ESTABLISHMENT AND MANAGEMENT OF NEW PLANTINGS/REPLANTINGS.

**Experiment 3.1 — Effect of shade cropping on the establishment and growth of coconut seedlings in the Intermediate Zone, Kirimatiyana Estate, Lunuwila — 1985.**

Initial growth of coconut seedlings measured six months after transplanting did not show an improvement due to shading over the control. However, the microclimate, measured in terms of air temperature and relative humidity in banana and gliricidia plots appeared to be more favourable than in ipil-ipil and control plots. Supplementary irrigation of coconut seedlings was carried out with 22.5 l of water per seedling at fortnightly intervals during the dry period. In addition, effective palms in gliricidia plots were supplied with 14 kg of fresh leaf matter per palm.

The experiment is in progress.

*M. de S. Liyanage and H. A. Abeysoma*

## PROJECT 4 : STUDIES IN FIELD MANAGEMENT SYSTEMS

**Experiment 4.1.1 — Utilization of animal husbandry for optimization of coconut production. Bandirippuwa Estate, Lunuwila — 1984.**

The performance of *Brachiaria miliformis*, *Pueraria phaseoloides*, ipil-ipil and gliricidia in the five paddocks was satisfactory during the year. Gliricidia and ipil-ipil were harvested every six months and fed to cattle at the rate of 6 kg per head in the forage mixture. Live weight gains of animals were recorded at weekly intervals.

Coconut palms in the control plot were fertilized with the Adult Palm Mixture at the rate of 3 kg/palm in October. Palms in the treatment plots with cattle/pasture were fertilized with muriate of potash and saphos phosphate at the rates of 0.75 kg/palm and 0.18 kg/palm respectively. After providing for feeding, excess fresh loppings of gliricidia and Ipil-ipil were applied as mulch to the coconut palm.

Records on nut yield, copra weight, number of female flowers and immature nut fall were maintained during the year. Total returns of cowdung by the system were around 55 kg/palm during the year. Satisfactory average live weight gains of 300 g/head/day were observed during the year (Table 3).

**Table 2**—*Coconut and copra production in different cultural operations at Puwakwatte Estate, Kotadeniyawa. (Experiment 2.2.2)*

| *Ttreatments* | *Coconut yield Nuts/palm* | *Copra weight Mt/ha* |
|---|---|---|
| $T_1$ | 40.8 | 1.24 |
| $T_2$ | 41.8 | 1.26 |
| $T_3$ | 33.4 | 1.02 |
| $T_4$ | 35.2 | 1.0 |
| $T_5$ | 39.5 | 1.19 |
| $T_6$ | 36.6 | 1.12 |
| $T_7$ | 27.3 | 0.71 |
| $T_8$ | 32.3 | 0.87 |
| $T_9$ | 20.7 | 0.52 |
| $T_{10}$ | 28.4 | 0.78 |
| $T_{11}$ (control) | 39.1 | 1.07 |
| Sig. | * | * |
| LSD (P=0.05) | 9.56 | 0.29 |
| CV% | 19.98% | 21.15% |

$T_1$ =Opening up of $\frac{1}{4}$ circle trench and filled with Gliricidia leaves.

$T_2$ =Opening up of $\frac{1}{4}$ circle trench and filled with Goat dung.

$T_3$ =Opening up of of $\frac{1}{4}$ circle trench and filled with Sandy soil.

$T_4$ =Opening up of $\frac{1}{2}$ circle trench and filled with Gliricidia leaves.

$T_5$ =Opening up of $\frac{1}{2}$ cricle trench and filled with Goat dung.

$T_6$ =Opening up of $\frac{1}{2}$ circle trench and filled with Sandy soil.

$T_7$ =Opening up of full circle trench and filled with Gliricidia leaves.

$T_8$ =Opening up of full circle trench and filled with Goat dung.

$T_9$ =Opening up of full circle trench and filled with Sandy soil.

$T_{10}$=Opening up of full circle trench and filled with same soil.

$T_{11}$=Control.

**Table 3**—*Live weight of male animals.* (*Experiment* 4.1.1)

| *Month* | *Live weight* (*kg*) |
|---|---|
| 0 | 95.3 |
| 1 | 108.8 |
| 2 | 122.3 |
| 3 | 134.8 |
| 4 | 135.4 |
| 5 | 142.8 |
| 6 | 153.0 |
| 7 | 165.5 |
| 8 | 176.8 |
| 9 | 183.6 |
| 10 | 192.0 |
| 11 | 203.0 |
| 12 | 213.9 |

**Table 4**—*Live weights of heifers.* (*Experiment* 4.1.2)

| *Month* | *Live weight* (*kg*) |
|---|---|
| 0 | 77.5 |
| 1 | 91.3 |
| 2 | 104.0 |
| 3 | 115.2 |
| 4 | 114.0 |
| 5 | 123.8 |
| 6 | 135.6 |
| 7 | 144.9 |
| 8 | 154.0 |
| 9 | 157.2 |
| 10 | 164.4 |
| 11 | 176.0 |
| 12 | 187.7 |

Although there were no significant differences in nut yields due to the treaments over the control, general improvement in the coconut plantation was evident. It was apparent that this integrated system is a useful substitute for fertilizers especially nitrogen, to coconut, and also to provide organic matter.

*H. P. S. Jayasundera and R. Marasinghe*

**Experiment 4.1.2—Utilization of animal husbandry for optimization of coconut production. Ratmalagara Estate, Madampe—1985.**

Dry matter yield of *Brachiaria miliiformis* was 18,665 kg/ha while *Pueraria* had only around 3000 kg/ha as grass had smothered out most of the legume in the system. However the tree legumes, gliricidia and ipil-ipil, produced green matter of around 4 kg/tree which was adequate for feeding the cattle.

Six month old heifers (Jersey x Local) were introduced to paddocks in January. Each paddock consisting of 24 palms was grazed with four animals for six days. Rotational grazing management with stocking rate of 4 animals/ha was practised. Weekly live weight gains were measured on each animal before moving to the next paddock after six days. Average live weight gains of 300 g/head/day were observed during the year (Table 4).

Coconut yields and copra weights in each paddock were recorded during the year.

*H. P. S. Jayasundera and W. S. M. A. Fernando*

**Experiment 4.2.1—Survey on intercropping in the Intermediate Zone of the Coconut Triangle.**

An attempt was made to investigate the present status and to identify the constraints for intercropping in small holdings in the intermediate zone . Discussions were held with the Divisional Officers (DO), Coconut Development officers (CDO) and Agricultural Instructors (AI) attached to the Agrarian Service Centres.

It was revealed that the constraints for intercropping activities in small holdings were low cash income of farmers, inadequacy of diseasefree planting material, incidence of frequent droughts and problems relating to marketing and thefts.

*A. S. Ranatunga, R. A. J. R. Perera, M. H. F. G. Ivan Appuhamy and S. D. J. N. Subasinghe*

**Experiment 4.2.2—Case studies of ten successful farmers in the Intermediate Zone—1987.**

A study was undertaken on 10 farmers who had successfully carried out mixed farming activities, to assess their general farming characteristics, resources and opportunities and constraints. The study was based on facts gathered from the previous exploratory survey on coconut small holdings of the wet, semi-wet and dry zone and the informal survey on coconut-based cropping systems conducted by the Agronomy Division.

The main findings are as follows :

1. Intially, most of the farmers were in the low-income group. They had started farming with either intensive poultry farming or pineapple/ginger cultivation.
2. During the early stages of farming, their family labour involvements had been fairly high. Gradually, family labour had been reduced and substituted with hired labour as the cash income increased.
3. As the income increased, most of the farmers had restricted themselves to one or two aspects of crop husbandry and obtained special knowledge on them.
4. Major constraints faced by the farmers were shortage of diseasefree planting material, problems associated with leasing of lands for intercropping, thefts and inadequate extension support.

*A. S. Ranatunga, R. A. J. R. Perera, M. H. F. G. Ivan Appuhamy and S. D. J. N. Subasinghe*

**Experiment 4.2.3—On-farm adaptive trials in the Wet Intermediate Zone of Coconut triangle—1987.**

Fourteen cropping models were established in farmer's fields in Nattandiya, Dambadeniya and Kuliyapitiya areas during the Yala and Maha seasons.

The main objectives of establishing these models were to study the following:

1. Economic feasibility of coconut-based cropping systems.
2. Maximization of land utilization.
3. Labour involvement of such systems.
4. Pest and disease problems.
5. Effect of intercropping on coconut production.
6. Minimising drought effects through moisture conservation methods.
7. Total economic analysis of cropping models.

In order to assess the effect on coconut yields, 16 palms have been randomly selected in each of the farms with a control plot in the same location for yield comparison. Regular visits to the selected farms to guide the farmers and extract the necessary information for subsequent analysis have been done.

**Experiment 4.3—Quantitative study on the production of fuel wood and timber of *Leucaena leucocephala* grown in different planting systems under coconut and its effect on nut production. Ratmalagara Estate, Madampe—1986.**

During the year, records on coconut yield, copra weight number of female flowers, immature nut fall and growth parameters of ipil-ipil such as plant height, number of branches, girth at breast height (1.3 m) and basal diameter were maintained.

There were no significant differences in yield components of coconut and growth characters of ipil-ipil among the treatments. However, palms in ipil-ipil plots showed 8.6% increase in the number of nuts and 16.9% in copra weight over the control. Ipil-ipil planted in the double row system showed an increase of 10.34% in plant height, 10.3% in girth at breast height, 6.5% in basal diameter and 6.7% in the number of branches over the single row planting system.

*T. G. L. G. Gunasekera, L. V. K. Liyanage and H. A. Abeysoma*

**Experiment 4.4—Evaluation of *Gliricidia sepium* provenances in the Intermediate Zone of the Coconut Triangle. Ratmalagara Estate, Madampe—1987. (Collaborative trial with the Oxford Forestry Institute, U. K.)**

Two experiments were set up with the objective of evaluating a number of provenances of *Gliricidia sepium* for their initial growth, total biomass production of foliage and wood, pollarding ability, dry season leaf re-sprout and susceptibility to pests and diseases.

In the first experiment 13 provenances of *Gliricidia sepium* are being evaluated in an alley cropping system with 12 tree line plots to be interplanted with maize, replicated six times, in a randomized block design.

| *Provenance* | *Identity No* | *Country* |
|---|---|---|
| 1. | 13/84 | Guatemala |
| 2. | 14/84 | Guatemala |
| 3. | 15/84 | Guatemala |
| 4. | 17/84 | Guatemala |
| 5. | 25/84 | Honduras |
| 6. | 33/85 | Mexico |
| 7. | 35/85 | Mexico |
| 8. | 37/85 | Mexico |
| 9. | 38/85 | Mexico |
| 10. | 1/86 | Venezuela |
| 11. | 10/86 | Honduras |
| 12. | 12/86 | Costa Rica |
| 13. | 24/86 | Colombia |

As an alternative to the alley cropping design, provenances of *Gliricidia sepium* are being evaluated in pure plots in the second experiment. In this experiment, nine provenances of *Gliricidia sepium* are being planted in pure plots, each plot consisting of 64 trees at a spacing of 1.5 m x 1.5 m in a randomized block design with four replications.

| *Provenance* | *Identity No* |
|---|---|
| 1. | 13/84 |
| 2. | 14/84 |
| 3. | 15/84 |
| 4. | 17/84 |
| 5. | 25/84 |
| 6. | 10/86 |
| 7. | 12/86 |
| 8. | 14/86 |
| 9. | 24/86 |

Planting of the gliricidia provenances was completed in November. First assesment of the survival of provenances was made two weeks after planting. Initial growth rate is being monitored at 30 day interval.

*H. P. S. Jayasundera, L. V. R. Liyanage and M. de S. Liyanage*

## PROJECT 20: INTERCROPPING

**Experiment 20.1—Effect of three levels of fertilizer on four cacao selections grown under coconut. Walpita Estate, Kotadeniyawa—1977.**

Cacao bean yields were similar in varieties NA 32 and Millawana. There were no significant differences in bean yield between the normal recommended fertilizer dose and $\frac{1}{2}$ normal dose, indicating that the latter is sufficient for satisfactory yields. These results are similar to those obtained in 1986.

*K. B. Dassanayake, H. A. J. Gunathilake and M. J. I. Costa*

**Experiment 20.2—Mixed cropping model 1 to study the agronomic and economic feasibility of growing cacao, coffee and pepper together as mixed crops under coconut. Walpita Estate, Kotadeniyawa.—1977.**

The yield data of mixed cropping model are given in Table 5.

Pepper and cacao gave satisfactory production as in previous years. Vigorously growing cacao suppressed the growth of coffee thereby reducing the yield of the latter, which was very low compared with the yield of coffee grown alone under coconut.

*K. B. Dassanayake, H. A. J. Gunathilake and M. J. I. Costa*

**Experiment 20.3—Effect of intercropping perennial crops and rotation of annual crops on the yield of coconut. Sirikandura Estate, Dodanduwa—1978.**

The annual crops planted during the year are as follows :
Yala — Bushitao
Maha — Brinjal, capsicum, butter nut, bottle gourd, bitter gourd
The vegetables planted in Maha season are yet to be harvested.

The coconut yields during the period 1978 to 1986 and in 1987 are given in Table 6.

During the year intercropping with coffee, cinnamon, cloves with banana, cacao, rotation with annuals and pepper has increased coconut yields by 25.9%, 16.8%, 14.9%, 10.0% and 3.9% respectively over the control, despite drought effects.

Results from 1978 to 1987 demonstrated the long-term beneficial effects of intercropping practices on the yield of coconut.

*K. B. Dassanayake, H. A. J. Gunathilake and K. D. D. Appuhamy*

**Experiment 20.4—Mixed cropping model II to study the agronomic and economic feasibility of growing cacao and pepper together as mixed crops under coconut. Walpita Estate, Kotadeniyawa—1977.**

Yield data from this model are given in the Table 7.

All the cacao plants in this model came into flowering during the year, but only 32 trees produced pods. Crop yields of the system were low compared to the previous years, perhaps due to the effects of dry weather.

*K. B. Dassanayake, H. A. J. Gunathilake and M. J. I. Costa*

**Experiment 20.5—Effect of four levels of nitrogen and five levels of potassium on the growth and yield of cacao mixed with coconut. Walpita Estate, Kotadeniyawa—1981.**

Canopy radius and stem girth at six years after planting are given in Table 8.

Moderate levels of nitrogen and potassium continued to show a significant effect on vegetative growth. Bean production for the year was uneven due to drought effects during the first half of the year.

*K. B. Dassanayake, H. A. J. Gunathilake and M. J. I. Costa*

**Experiment 20.6—Demonstration of integrated farming systems in coconut lands, Dambuwa Mukalana Estate, Nattandiya—1981.**

During the year, coconuts and intercrops were maintained satisfactorily. The coconut crop recorded 11,565 nuts/ha, showing a drop of 26.5% over the previous year, which could be attributed largely to the low rainfall recorded in 1986 (1125 mm). During the year, 12 palms each from coffee, cocoa and pepper blocks were selected and provided with supplementary irrigation at the rate of 200 l of water per palm at 15 day intervals during the dry period, to compare their performance with those maintained under rainfed conditions. Supplementary irrigation was also provided to coffee, cocoa, pepper and citrus. Among other intercrops, ginger grown under the dense shade of young plantation and turmeric mixed with banana performed well.

**Table 5**—*Yield data from the mixed cropping model I at Walpita Estate, during the 9th year. (Experiment 20.2)*

| *Treatment* | *No. of Plants* | *No. of plants in Production* | *Total yield* | *Yield/plant* |
|---|---|---|---|---|
| Coconut | 24 | 24 | 1912 (fresh nuts)<br>325.4 kg (copra) | 79.7 (fresh nuts)<br>13.6 kg (copra) |
| Cacao | 48 | 48 | 11.1 kg | 480.0 g |
| Pepper | 81 | 80 | 50.5 kg | 784.0 g |
| Coffee | 98 | 28 | 22.0 kg | 78.4 g |

**Table 6**—*Effect of various intercrops on yield of coconut at Sirikandura Estate, Dodanduwa. (Experiment 20.3)*

| *Treatment* | *Yield of coconut 1978-1986 nuts/ha/yr* | *Yield of coconut/ha 1987* | *Copra Yield/nut(g) 1987* | *Copra production (MT/ha) 1987* |
|---|---|---|---|---|
| Coconut (Control) | 7011 | 7663 | 211.5 | 1.60 |
| Coconut + Cacao | 8698 | 8804 | 214.7 | 1.93 |
| Coconut + Coffee | 9099 | 9646 | 213.6 | 2.17 |
| Coconut + Pepper | 7476 | 7963 | 220.3 | 1.73 |
| Coconut + Clove + Banana | 8248 | 8808 | 204.0 | 1.80 |
| Coconut + Cinnamon | 9427 | 8946 | 209.7 | 2.03 |
| Coconut + Rotation with annuals | 8834 | 8431 | 205.2 | 1.84 |
| Sig. | | ** | | |
| CV% | | 9.09 | 3.76 | |
| Std. Error | | 4.75 | 7.98 | |

**Table 7**—*Yield data from the mixed cropping model II at Walpita Estate, during the 6th year.* (*Experiment* 20.4)

| *Treatment* | *No. of plants* | *No. of plants in production* | *Total yield* | *Yield/plant* |
|---|---|---|---|---|
| Coconut | 25 | 25 | 1794 (fresh nuts)<br>314.3 kg (copra) | 71.3 (Nuts)<br>12.5 kg (copra) |
| Cacao | 100 | 32 | 41.1 | 1285.0 g |
| Pepper | 96 | 48 | 7.6 | 158.0 g |

**Table 8**—*Stem girth and canopy radius of cacao due to different levels of nitrogen and potassium.* (*Experiment* 20.5)

| *Treatments* | *Stem girth (cm)* | *Canopy radius (m)* |
|---|---|---|
| N levels | | |
| $N_0$ | 23.36 | 1.67 |
| $N_1$ | 28.59 | 1.93 |
| $N_2$ | 33.21* | 2.02* |
| $N_3$ | 29.83 | 1.90 |
| K levels | | |
| $K_0$ | 26.30 | 1.78 |
| $K_1$ | 26.89 | 1.91 |
| $K_2$ | 28.94 | 1.92 |
| $K_3$ | 32.80* | 1.96* |
| $K_4$ | 28.80 | 1.82 |
| Sig. N | *** | *** |
| K | *** | * |
| N & K | *** | |
| CV% | 2.84 | 6.34 |

During the year, technical advice and planting material were provided for a large number of coconut growers.

*M. de S. Liyanage and K. M. Punchibanda*

## 3. NEW RECOMMENDATIONS

Based on the findings of experiment No. 1.8 (Annual Report 1986), the use of coir dust in pits has been recommended for moisture conservation in coconut lands,, specially in lateritic gravel soil.

## 4. VISITS, LECTURES AND SYMPOSIA

Mrs. L. V. K. Liyanage participated at the International Workshop on *Gliricidia sepium:* Management and Improvement held in Turrialba, Costa Rica from 21-27 June organized by the Nitrogen Fixing Tree Association and the Centro Agronomic Tropical de Investigacion Y Ensenanza (CATIE).

Mr. M. de S. Liyanage undertook a study tour to the International Institute of Tropical Agriculture in Nigeria during the period 18 September-17 October. This visit was sponsored by the World Bank under the Puttalam District Integrated Rural Development Project (IRDP) of the Ministry of Plan Implementation.

Mrs. L. V. K. Liyanage participated at the Workshop on Multipurpose Tree Species for Small Farm Use in Pattaya, Thailand from 1-5 November, organized by the Winrock International Institute for Agric. Development in Thai-and, International Development Research Centre, Canada and FAO.

Mr. D. N. S. Fernando, participated at the meeting on Multipurpose Tree Species for Small farm Use in the Arid and Semi-Arid Tropics in Karachi Pakistan from 16-19 November, organized by the Winrock International Institute in Thailand (Forestry/Fuelwood Research and Development Project).

Mr. K. B. Dassanayaka delivered talks on Intercropping in coconut lands at the 'Agromart 87' Workshop in Colombo, organised by the Women's Chamber of Industry and Commerce on 9 June and for the Agricultural Officers of the Department of Agriculture, Kegalle on 15 October.

Mr. H. P. S. Jayasundera delivered lectures on Fertilizer Usage for Intercropping in Coconut Lands at the seminars organised by the National Fertilizer Corporation at Warakapola and Yakwila on 9 May and 21 November, respectively.

Mrs. L. V. K. Liyanage delivered several lectures at the Diploma in Plantation Management Course of the National Institute of Plantation Management. Mr. K. B. Dassanayaka conducted field demonstrations on intercropping at Walpita Estate for the same course.

Mr. H. P. S. Jayasundera participated in the workshop on Improved Production and Utilization of Food Legumes in Sri Lanka at the Inservice Training Institute, Peradeniya from 22-26 June, organized jointly by the Faculty and Postgraduate Institute of Agriculture, Peradeniya, Department of Agriculture and University of Southampton, U. K.

Mr. M. de S. Liyanage and Mr. K. B. Dassanayaka participated in the CIDA Grantees seminar organised by the NARESA from 29 June to 01 July at Pegasus Reef Hotel, Wattala.

Mrs. L. V. K. Liyanage and Mr. H. P. S, Jayasundera participated in the Workshop on Nitrogen Fixation and soil Fertility at the Postgraduate Institute of Agriculture Peradeniya on 5 December. This was organized by the Sri Lanka-Belgium Nitrogen Fixation and soil Fertility Project, National Agric. Society of Sri Lanka and Faculty of Agriculture, University of Peradeniya.

## 5. EXTENSION ACTIVITIES

Several training programmes were conducted for trainees from the Coconut Development Training Centre, Lunuwila, National Institute of Plantation Management, National Apprenticeship Board and for students of Agriculture from Aquinas College.

A number of advisory letters regarding intercropping, use of cover crop, husks and coir dust in moisture conservation, weed control were dealt with.

A field day was held at Sirikandura Estate, Dodanduwa for coconut growers in the Southern Province in May.

## 6. PUBLICATIONS


Liyanage, L. V. K. (1987—Moisture conservation in coconut lands. *Coconut Bulletin* 4 (2) : 1-5.

Liyanage, L. V. K. (1987)—Traditional uses of gliricidia in Sri Lanka. NFTA 1987 *Gliricidia sepium* (Jacq) Walp. Management and Improvement. *Proceedings of a Workshop held at CATIE, Turrialba, Costa Rica, June*, 1987. *Nitrogen Fixing Tree Association Special Publication* 87-01 : 92:94.

Liyanage, L. V. K. and Wijeratne, A. M. U. (1987—Uses and management of *Gliricidia sepium* in coconut plantations of Sri Lanka. NFTA 1987. *Gliricidia sepium* (Jacq). Management and Improvement. *Proceedings of a Workshop held at CATIE, Turrialba, Costa Rica, June* 1987. *Nitrogen Fixing Tree Association Special Publication* 87-01 : 95-101.

Liyanage, M. de S. and Jayasundera, H. P. S. (1987)—Intercropping Food Legumes under coconut. Proceedings of a seminar on "Improved production and Utilization of food legumes in Sri Lanka." June 23-26, 1987, Peradeniya : 37-42

Liyanage, M. de S. and Martin, M. P. L. D. (1987)—Soybean-coconut intercropping *Cocos* 5 : 28-31.

## 7. PAPERS PRESENTED AT CONFERENCES AND SEMINARS/WORKSHOPS

Liyanage, L. V. K. (1987)—Soil and moisture conservation in coconut lands. Paper presented at the Coconut Research Conference held at Koggala Beach Hotel, Koggala in May.

Liyanage, L. V. K., H. P. S. Jayasundera and T. G. L. G. Gunasekara (1987)—Potential uses of Nitrogen Fixing Trees on small coconut plantations in Sri Lanka. Poster presentation at the Workshop on Multipurpose Tree Species for Small Farm Use in Pattaya, Thailand in November.

Liyanage, L. V. K. and H. P. S. Jayasundera (1987)—Potential for use of Nitrogen Fixing Trees in coconut plantations. Paper presented at the Workshop on N-fixation and soil fertility at the Postgraduate Institute of Agriculture, Peradeniya in December.

Liyanage, L. V. K. and A. M. U. Wijeratne (1987—Uses and management of *Gliricidia sepium* in coconut plantations of Sri Lanka. Paper presented at the International workshop on the Management and Improvement of *Gliricidia sepium* at CATIE, Turrialba, Costa Rica in June.

Liyanage, M. de S. (1987)—Intercropping in coconut lands. Paper presented at the Coconut Research Conference held at Koggala Beach Hotel, Koggala in May.

## ACKNOWLEDGEMENTS

The assistance given by the staff of Agronomy Division in conducting the experiments and in the preparation of the report is gratefully acknowledged. Thanks are due to Mr. D. T. Mathes, Officer in charge of Biometry Unit, Mr. T. S. G. Peiris, Biometrician and their staff, for designing of experiments and for analyses of data.

# REPORT OF THE
# GENETICS & PLANT BREEDING DIVISION

**Head—M. R. T. Wickramaratne, Ph.D**

## 1. GENERAL

### 1.1 Appointments

No new appointments were made during the year.

### 1.2 Resignations and Retirements

Mr. H. Samarasinghe, Technical Assistant, resigned with effect from 15 January. Mr. R. D. Hector Appuhamy, Laboratory and Field Assistant, resigned with effect from 2 July after serving in the division for 32 years.

### 1.3 Study Leave

Mr. R. R. A. Peiris, Research Assistant, continued his postgraduate training leading to Ph.D, at the Department of Agriculture, University of Queensland Australia. His research programme includes studies on genetic variation in drought resistance.

### 1.4 Transfers

The following transfers were effected :

| *Name* | *From* | *To* | *Date* |
|---|---|---|---|
| Mr. M. H. L. Padmasiri, T/A | ISG | H/O | January |
| Mr. M. Victor, F/A | ISG | H/O | —do— |
| Mr. A. M. Ranasinghe Banda, F/A | H/O | ISG | —do— |
| Mr. Paul B. Fernando, Pollination/ Emasculation labourer | H/O | ISG | —do— |
| Mr. L. Karunathilake, Beetle Catcher | ISG | H/O | —do— |
| Mr. D. D. Piyasena, Watcher | ISG | Kirimetiyana Estate | —do— |
| Mr. K. D. L. Gunatilake, Watcher | Walpita | ISG | —do— |

### 1.5 Promotions

The following officers were promoted:

| *Name* | *From* | *To* | *Effective date* |
|---|---|---|---|
| Dr. M. R. T. Wickramaratne | Executive Grade Class I | Excutive Grade Special Class | October |
| Miss M. A. S. Fernando | Technical Grade Class II | Technical Grade Class I | Jan. 1985 |
| Mrs. W. B. S. Fernando | | | —do— |
| Mr. M. H. L. Padmasiri | | | —do— |
| Mr. T. M. W. Peiris | Operative Grade Class II | Operative Grade Class I | —do— |
| Mr. D. M. Sarathchandra | Minor Grade Class I | Minor Grade | —do— |
| Mr. K. P. Antony | | Special Class | —do— |
| Mr. J. A. Hubert | | | —do— |
| Mr. H. P. Karanis | Minor Grade Class II | Minor Grade Class I | —do— |

### 1.6 Completion of 25 years service

The following officers completed 25 years service and were feted and presented with souvenirs at a ceremony on 17 March.

Mr. D. M. Pathirage

Mr. R. D. Hector Appuhamy

Mr. H. Bandappuhamy

Mr. M. J. Peter Perera

Mr. A. P. Justin

### 1.7 Collaborative Research

The collaborative project with the University of Reading did not receive further funding by ODA. However, with the kind assistance of Mr. Richard Coe of Reading University and Dr. Kevin Seneviratne and other staff of the University of Colombo and the use of the computing equipment gifted by ODA, it has been possible to progress slowly but steadily in the analysis of data.

## 2. RESEARCH PROJECTS

### PROJECT 5 PRODUCTION OF IMPROVED COCONUT VARIETIES

**Experiment 5.1.1—Evaluation of five improved cultivars at Bandirippuwa Estate, Lunuwila (1984)**

*I. J. S. Kondasinghe and W. B. S. Fernando*

**Experiment 5.1.2—Evaluation of five improved cultivars at Thammenna Estate, Puttalam (1984)**

*W. G. A. Ratnasiri and H. P. P. H. Pathirana*

**Experiment 5.1.3 Evaluation of five improved cultivars at Dambakande Estate, Kurunegala (1984)**

*I. J. S. Kondasinghe and H. P. P. H. Pathirana*

**Growth and vigour of seedlings**

Growth parameters such as the number of new leaves produced, girth at collar and height from ground to the tip of the last fully-opened leaf were recorded at six-monthly intervals, at 24 and 30 months from planting out, for each plant at all three sites.

The data at 24 months which were combined in an analysis of variance confirmed the results obtained last year. The overall performance of cultivars was very different at the different sites and there were also clear differences in performance of different cultivars. at a single site. No significant variety-site interaction was detected at this stage.

Table 1 shows the growth parameters for the five cultivars at the three different sites. The clearest differences were in leaf production at the three sites; the mean number of new leaves over the last six month period was 2 at Dambakande, 3 at Bandirippuwa and nearly 4 at Thammenna. Significant varietal differences were also present but were not as distinct as site effects. At all three sites, the two hybrid cultivars had similar rates of leaf production which were significantly higher than in the tall cultivars. There were no marked differences within groups (tall and hybrid) at this stage.

Considering girth at collar, there were again clear differences at the three sites, mean girth achieving 47.08, 52.15 and 62.84 cm at Dambakande, Thammenna and Bandirippuwa respectively. At Dambakande, there were significant varietal differences with the two hybrid cultivars being very similar and much better in performance than the tall cultivars. Differences in varieties at the other sites were less marked.

Height appeared to be less important than the other growth parameters recorded, with no significant differences in varieties at two out of the three sites.

**Table 1** *Growth parameters for five coconut cultivars at three sites, at 24 months from planting out in the field.*

| | *Bandirippuwa* | | *Dambakande* | | *Thammenna* | |
|---|---|---|---|---|---|---|
| *Leaf Production (mean no. of new leaves produced during last six months)* | | | | | | |
| | *Mean* | *Range* | *Mean* | *Range* | *Mean* | *Range* |
| DG × tall† | 3.25 | 3.0—3.6 | 2.14 | 1.9—2.3 | 4.03 | 3.8—4.2 |
| DY × tall‡ | 3.20 | 2.8—3.5 | 2.10 | 2.0—2.2 | 4.15 | 4.0—4.3 |
| Ambakelle tall (TT) | 2.85 | 2.8—2.9 | 1.63 | 1.5—1.8 | 3.53 | 3.3—3.7 |
| Moorock tall (MT) | 2.78 | 2.6—2.9 | 1.69 | 1.6—1.8 | 3.58 | 3.3—3.9 |
| Plus palm tall (PP) | 2.65 | 2.3—2.9 | 1.55 | 1.4—1.7 | 3.58 | 3.2—3.8 |
| S. E. diff. | 0.11 | | 0.08 | | 0.14 | |
| | * | | * | | * | |
| *Mean girth at collar (cm)* | | | | | | |
| | *Mean* | | *Mean* | | *Mean* | |
| DG × tall | 63.50 | | 52.53 | | 53.65 | |
| DY × tall | 66.70 | | 51.10 | | 51.25 | |
| Ambakelle tall (TT) | 60.20 | | 44.04 | | 51.45 | |
| Moorock tall (MT) | 63.25 | | 46.51 | | 48.40 | |
| Plus palm tall (PP) | 60.55 | | 41.24 | | 55.85 | |
| S. E. diff. | 1.78 | | 2.83 | | 2.64 | |
| | ** | | * | | *N.S.* | |
| *Mean height (m)* | | | | | | |
| DG × tall | 3.53 | | 3.10 | | 2.98 | |
| DY × tall | 3.88 | | 3.26 | | 2.84 | |
| Ambakelle tall (TT) | 3.58 | | 3.13 | | 2.98 | |
| Moorock tall (MT) | 3.83 | | 3.13 | | 2.86 | |
| Plus palm tall (PP) | 3.63 | | 2.94 | | 3.24 | |
| S. E. diff. | 0.09 | | 0.14 | | 0.20 | |
| | * | | *N.S.* | | *N.S.* | |

† DG X tall, dwarf green X tall
‡ DY X tall, dwarf yellow X tall
* $P < 0.05$; **, $P < 0.01$; NS, not significant

The indications are that the hybrids are more vigorous than talls and that differences between the two hybrid varieties may become clearer at a later stage. Moorock tall and plus palm tall cultivars seemed to have longer petioles than the others, on visual observation, but no measurements were taken.

It is noteworthy that the young palms at Thammenna showed the highest leaf production and also the lowest stature, corroborating the observations made last year.

Four hybrid palms, one DY x T (no 145) and three DG x T (nos. 42, 76 and 282), are already in stem at Bandirippuwa and the DY x T has also come into flower. At Dambakande, two DG x T (nos. 40 and 168) are in stem but no flowering has yet been observed. At Thammenna there are no palms yet in stem or in flower.

**Cultural operations**

Due to the prevailing drought conditions it was decided to establish husk pits of dimension 1.5 x 1.2 x 0.6 m (5 x 4 x 2 ft.) at a distance of 1.8 m (6 ft) away from each palm in these trials. This operation was completed at Thammenna and was in progress at Bandirippuwa and Dambakande. Cover crops were sown on the huskpits at Thammenna but did not establish well.

**Damage by black beetle**

Repeated black beetle attacks at Thammenna were brought under control, using Monocrotophos at a dilution of 5 ml. in 250 ml of water when the damage was severe, followed up by BHC powder to keep the pest in check. A total of 13 DY x T, 2 DG x T and 3 Ambakelle tall seedlings died as a result of black beetle damage and had to be replaced while one Moorock tall seedling has been replaced twice, to date. Two Moorock tall seedlings and two Ambakelle tall seedlings were severely attacked by black beetle but recovered. There was no severe attack of plus palm seedlings by black beetle at this site.

Attacks by this pest were also encountered at Bandirippuwa but were kept in check by frequent inspections and extraction and collection of the pests. Three seedlings of the types DG x T, DY x T and Moorock tall were severely attacked but recovered.

This pest did not cause concern at Dambakande.

The data at 30 months are being processed. The trial continues.

*W. M. U. Fernando and M. R. T. Wickramaratne*

**Experiment 5.1.4 Evaluation of five improved cultivars at Palugaswewa Estate, Rajakadaluwa (1985)**

Frequent black beetle attacks which could not satisfactorily be brought under control in spite of prophylactic measures undertaken caused a severe set back to the progress of this trial. Growth and development of the seedlings were greatly retarded, so much so that attempting to analyse results at this stage would be futile except for using them to study susceptibility of the cultivars to black beetle damage.

Seventy five seedlings out of the total of 400 have been severely attacked by black beetle, to date, and they were wide spread throughout the trial. Details of these seedlings are given in Table 2. More than half of them were of the hybrid cultivars.

It appears that the DG x T hybrid is the most susceptible to black beetle attack and the DY x T and Ambakelle tall are similar. Moorock tall and plus palm tall cultivars seem hardier and recovery after attack was best in Moorock tall.

*W. M. U. Fernando, M. A. S. Fernando and M. R. T. Wickramaratne*

**Table 2** *Extent of black beetle damage on trial at Palugaswewa Estate, Rajakadaluwa*

| *No. of seedlings* / *Cultivar* | *Severely attacked but recovered* | *Dead and replaced once* | *Dead and replaced twice* | *Total* |
|---|---|---|---|---|
| DG×tall | 11 | 11 | — | 22 |
| DY×tall | 7 | 10 | — | 17 |
| Ambakelle tall | 8 | 8 | — | 16 |
| Moorock tall | 10 | 1 | 1 | 12 |
| Plus palm tall | 1 | 7 | — | 8 |
| Total | 37 | 37 | 1 | 75 |

**Experiment 5.1.5—Evaluation of five improved cultivars at Suriyapura Estate, Henegama (1986)**

Due to large variation in soil, this trial was planted in two parts and should really be considered as two "variety trials" for testing the same five cultivars at a single site. The design, described in the Annual Report of 1985, is briefly as follows:

Trial A—4 complete blocks, plots of size 9 palms

Trial B—28 blocks of irregular size, plots of size 1 (single palm plots)

Cultivars in both trials are as follows :

1. dwarf green x tall (DG x T)
2. dwarf yellow x tall (Dy x T)
3. Ambakelle tall (TT)
4. Moorock tall (MT)
5. Plus palm tall (PP)

The variables girth, height and number of new leaves were recorded at six-montly intervals. The data at 18 months from planti g have not yet been completely analysed but a cursory examination of varietal means for trial A shows that mean leaf production for

all varieties ranged from 3.43 to 4.12 with the hybrid cultivars attaining the highest values. Thus mean leaf production was higher than at the other sites, at the same age, possibly due to the better rainfall, but shows the same trend of hybrids having higher rates of leaf production.

Considering girth and height at 18 months, the performance of DY x T was superior to all other cultivars including DG x T which was not very different from the tall cultivars.

Trial B was planted in a much more variable piece of land and shows retarded growth and greater variation.

The trial continues. Black beetle damage at this site is negligible.

*W. M. U. Fernando, H. S. G. Kularatne and M. R. T. Wickramaratne*

**Experiment 5.2—Identification of parent palms for use in the breeding programme. Response of genotypes to year-to-year changes in weather at ISG, Ambakelle (1982)**

A method for selection of superior palms with high and stable yields for use as parent palms, devised by Mr. Richard Coe, Consultant Statisttcian, was used to identify suitable palms on field no. 1 at ISG. It seems that palms identified by this method have nearly all been identified already on the method used previously. This is encouraging as it implies that the methods are capable of identifying palms which are at least phenotypically superior.

The study continues.

*M. R. T. Wickramaratne and W. M. U. Fernando*

**Experiment 5.3—Pollen processing-To improve techniques of collection, processing and storage of coconut pollen (1983)**

The fluid bed drier, introduced in 1985, continues to be extremely useful in the processing of large quantities of pollen within a few hours.

The flower stripper was handed back to the manufacturers for modification of certain defects in construction. Alterations made to the machine were not completely satisfactory; modifications are still in progress.

The freeze drier has not yet been commissioned due to the nonavailability of the necessary technical advice.

*M. R. T. Wickramaratne, W. M. U. Fernando and W. B. S. Fernando*

**Experiment 5.4—Pollination of selected palms at the Isolated Seed Garden, Ambakelle, in different combinations and evaluation of the progeny (1984)**

**Experiment 5.4.1—Pollination of selected tall palms (Ambakelle special) at ISG, Ambakelle, using tall, *dwarf green or San Ramon* pollen from palms believed to be drought tolerant.**

The crosses were carried out during 1984 and nuts harvested in 1985. Trials for evaluation of the progeny were planted in 1986 as follows :

**Experiment 5.4.1.1—Trial at Bandirippuwa Estate, Lunuwila, (50 acre block) for evaluation of progeny from *tall*×*tall*, *tall*×*dwarf geen* and *tall*×*San Ramon* crosses (1986)**

*W. M. U. Fernando and H. P. P. H. Pathirana*

**Experiment 5.4.1.2—Trial at Ratmalagara Estate, Madampe, (field no. 2) for evaluation of progeny from *tall*×*tall*, *tall*×*dwarf geen* and *tall*×*San Ramon* crosses (1986)**

*I. J. S. Kondasinge and M. A. S. Fernando*

**Experiment 5.4.1.3—Trial at NLDB Andigama Farm, Giriulla, (Mudalihamy block) for evaluation of progeny from *tall*×*tall*, *tall*×*dwarf geen* and *tall*×*San Ramon* crossess (1986)**

*I. J. S. Kondasinghe and H. S. G. Kularatne*

The trials at Bandirippuwa and Ratmalagara were planted in Yala 1986 and that at Andigama in Maha of the same year. The design is a 3 x 3 factorial with three varieties and three fertilizer levels but the differential fertilizer treatments will be introduced only after four years from planting.

The trials were maintained satisfactorily and growth parameters recorded at six monthly intervals. The means of measured variables at 12 months from planting (Table 3) showed that the *tall*×*dwarf green* crosses were the most vigorous at all three sites, closely followed by the *tall*×*San Ramon* hybrids. The magnitude of the differences in varietal performance varied from site to site.

At 12 months from planting, nearly all the hybrid seedlings (97.8% of *tall* × *SR* and 100% of *tall* × *DG*) had split their leaves but amongst the *tall*×*tall*, a few seedlings (18.8%) still remained with unsplit leaves. The earlier data are being examined to ascertain whether there were any clear differences between the two hybrid varieties in that data set.

As in the trial for the evaluation of cultivars (Experiment 5.1.1) here too comparison of the performance at different sites shows signs of a negative correlation between leaf production and girth at collar.

The trial continues.

*M. R. T. Wickramaratne and W. M. U. Fernando*

**Experiment 5.4.1.4—Trial at JEDB Mangala Eliya Estate, Puttalam, for evaluation of progeny from *tall*×*tall*, *tall*×*dwarf geen* and *tall*×*San Ramon* crosses (1987)**

Planting of this trial was completed in May. In addition to the three varieties, *tall*×*tall*, *tall*×*dwarf green and tall x San Ramon*, a fourth, open-pollinated material from Ambakelle special palms, was used as a control. Thus, the design was a 4×3 factorial with 4 varieties and 3 fertilizer levels giving 12 treatments, replicated 3 times with 10 seedlings per plot at a spacing of 7.3×7.3 m (24×24 ft.) square.

A total of 360 polybagged seedlings was used for planting this trial and 99 Ambakelle special seedlings were used for the guard rows. This latter were not polybagged and the

**Table 3** *Mean growth parameters for three types of progeny at three sites, at twelve months from planting out in the field.*

| *Site* | *Bandirippuwa* | *Ratmalagara* | *Andigama* |
|---|---|---|---|
| *Parameter* | | | |
| 1. Leaf Production | | | |
| (*a*) Mean number of new leaves produced during last six months | | | |
| Tall × SR | 3.88 | 3.86 | 3.44 |
| Tall × DG | 3.89 | 4.23 | 3.69 |
| Tall × tall | 3.30 | 3.54 | 3.22 |
| (*b*) Mean number of split leaves | | | |
| Tall × SR | 3.83 | 3.82 | 3.31 |
| Tall × DG | 3.89 | 4.16 | 3.64 |
| Tall × tall | 3.00 | 3.44 | 2.44 |
| 2. *Mean girth at collar* (*cm*) | | | |
| Tall × SR | 24.14 | 24.47 | 28.99 |
| Tall × DG | 26.92 | 24.45 | 31.58 |
| Tall × tall | 24.93 | 21.07 | 26.58 |
| 3. *Mean height* (*m*) | | | |
| Tall × SR | 1.82 | 2.44 | 2.29 |
| Tall × DG | 2.08 | 2.48 | 2.41 |
| Tall × tall | 1.89 | 1.97 | 2.13 |

S R, San Ramon; DG, dwarf green

long dry spell which immediately followed planting caused a high number of casualties. A total of 65 guard row seedlings had to be replaced in the Maha season. There were no casualties in the seedlings within the trial.

*W. G. A. Ratnasiri and M. H. L. Padmasiri.*

**Experiment 5.4.1.5—Observation block at Bandirippuwa Estate, Lunuwila (1986)**

Seedlings left over after planting trials for experiments 5.4.1.1 to 5.4.1.4 were handed over to Bandirippuwa Estate for planting an observation block for evaluation of these crosses under conditions of management by the estate. Fifty seedlings of each of the crosses *tall* × *dwarf green, tall* × *San Ramon, dwarf green* × *tall and dwarf green* × *San Ramon* were handed over. The seedlings were mixed and planted in field no. 7, Iruhatha block, Bandirip-

puwa Estate, in no particular design, under the supervision of the estate staff. Although scheduled for planting in Maha 1986, planting was completed only in January 1987, the number of seedlings planted being 45, 46, 47 and 45 respectively of the four above-mentioned crosses.

Casualties were replaced twice during the year, using a total of 76 seedlings comprising 19, 22, 15 and 20 seedlings respectively, of the four crosses. The casualty rate to date is over 40.%

*M. H. L. Padmasiri and M. R. T. Wickramaratne*

**Experiment 5.4.2. Pollination of selected tall (*Ambakelle special*) and dwarf palms at *ISG* using *tall, dwarf green* and *San Ramon* pollen from palms selected for high and stable yields.**

The crosses were carried out in 1985 and nuts harvested in 1986. Trials for evaluation of the progeny were planted in 1987 as follows :

**Experiment 5.4.2.1—Trial at NLDB Andigama Farm, Giriulla (Puras block), for evaluation of progeny from *tall* × *tall*, *tall* × *dwarf green*, *tall* × *San Ramon*, and *dwarf green* × *San Ramon* crosses (1987)**

Planting of this trial was completed in September. The design was a 4 x 3 factorial with 4 varieties and 3 fertilizer levels giving 12 treatments. This was replicated thrice with 10 seedlings per plot. Spacing was at 7.6 m (25 ft) traingular.

Growth measurements were recorded at planting and the trial was maintained satisfactorily.

*I. J. S. Kondasinghe and M. H. L. Padmasiri*

**Experiment 5.4.2.2—Trial at JEDB Daisy Valley Estate, Maawathagama, for evaluation of progeny *from tall* × *tall*, *tall* × *dwarf green*, *tall* × *San Ramon*, *dwarf green* × *tail* and *dwarf green* x *San Ramon* crosses (1987)**

This trial has a 5 × 3 factorial design with five varieties and three fertilizer levels giving 15 treatments, replicated thrice with 15 seedlings per plot, at a spacing of 7.6 m (25 ft.) triangular. The surplus 110 tall × San Ramon seedlings were used in guard rows.

The trial was scheduled for planting in September but water logging of the planting site, which is low lying and adjacent to a paddy field, caused a postponement of planting to December. Drainage drains were established at the site.

Growth measurements were recorded at planting and it was clear that there were distinct differences between varieties in split leaves, the values being 15.5%, 68.8,% 94.4,% 94.4% and 95.5% in *tall* × *tall*, *tall* × *San Ramon*, *tall* × *dwarf green*, *dwarf green* × *tall* and *dwarf green* × *San Ramon* crosses respectively. It appears, therefore that in seedlings where DG is a parent, splitting of leaves occurs early while when tall is a parent it is delayed. The San Ramon crosses attain intermediate values. It was decided to score split leaves monthly upto six months in order to study this phenomenon further.

*W. M. U. Fernando, M. A. S. Fernando and M. R. T. Wickramaratne*

**Experiment 5.4.3—Pollination of selected tall (*Ambakelle special*) and *dwarf* palms at ISG, using *tall, dwarf green, dwarf yellow* and *San Ramon* pollen from palms selected for high and stable yield (1986)**

A total of 12 different types of crosses using unmixed pollen so that full sibs of known parentage would result were carried out in 1986 and nuts harvested in 1987. A total of 1 296 inflorescences were pollinated and 4,765 nuts harvested. Details of these crosses are given in Table 4. There are slight discrepancies in results of crosses tabulated for two consecutive years as some inflorescences bagged in December are pollinated only in January, and figures are given only upto 31 December each year.

Percent fruit harvested ranged from 5.92 for *dwarf green* X *dwarf green to 22.06* for *tall* X *San Ramon*. As has been noted before, crosses using *San Ramon pollen* were again the most fruitful and those with dwarf pollen the least. The differences in fruit harvested between crosses using dwarf green and dwarf yellow pollen were very slight. The percent fruit harvested from hand pollinations was generally lower than last year, probably due to the poor weather conditions which prevailed, perhaps causing excessive button shed and immature fruit fall.

Inactivated pollen or lycopodium was issued occasionally to check pollination techniques. It is of interest that although no viable seed was set from application of either of these to the stigma, even inactivated pollen sometimes caused fruit to set; these fruit usually fell off before maturity (by about 6 months) but occasionally developed until harvest when they were found to be empty inside so that these 'fruits' had only husk and no shell or kernel. Lycopodium did not have a similar effect. Details are given in Table 5.

Due to the urgent need for seednuts to plant the planned special seed garden at Kirimetiyana the crossing programme for producing 12 different types of crosses was discontinued this year and all the selected palms in fields 1 and 2 (a total of 50 as one in field no. 1 was weak and tapering and hence excluded from the programme) were used for producing *tall* X *tall* material, referred to as "*Ambakelle super*". Details are given under Experiment 5.4.5.

*W. M. U. Fernando, M. H. L. Padmasiri, W. B. S. Fernando and M. R. T. Wickramaratne*

**Experiment 5.4.4—Self pollination of selected *dwarf green* and *dwarf yellow* palms at ISG Ambakelle (1982)**

This programme, for providing material for infilling vacancies in the dwarf palm blocks at the seed garden, was continued on fields 5,9 and 10A, using 12, 15 and 5 *dwarf green* palms respectively and 25 *dwarf yellow* palms on field 10A. A minimum of 1,700 nuts is expected to result, details of which are given in Table 6.

*W. M. U. Fernando, M. H. L. Padmasiri, and M. R. T. Wickramaratne*

**Table 4** *Nuts harvested from hand pollinations carried out in* 1986

| *Cross** | *No. of inflorescences pollinated* | *No. of flowers/buttons/nuts at* bagging | 3 months | 6 months | harvest | *Percent* harvest |
|---|---|---|---|---|---|---|
| *Tall seed parent* | | | | | | |
| Tall × tall | 195 | 5 920 | 1 363 | 1 270 | 1 126 | 19.02 |
| Tall × DG | 173 | 3 762 | 849 | 815 | 695 | 18.47 |
| Tall × SR | 165 | 4 289 | 1 073 | 1 021 | 946 | 22.06 |
| Tall × DY | 149 | 4 109 | 827 | 785 | 704 | 17.13 |
| *Total* | 682 | 18 080 | | | 3 471 | 19.20 |
| *Dwarf green seed parent* | | | | | | |
| DG × tall | 100 | 2 148 | 458 | 401 | 217 | 10.10 |
| DG × DG | 105 | 2 298 | 559 | 450 | 136 | 5.92 |
| DG × SR | 76 | 1 580 | 248 | 285 | 172 | 10.89 |
| DG × DY | 58 | 1 335 | 260 | 216 | 119 | 8.91 |
| *Total* | 339 | 7 361 | | | 644 | 8.75 |
| *Dwarf yellow seed parent* | | | | | | |
| DY × tall | 80 | 1 838 | 287 | 269 | 237 | 12.89 |
| DY × DG | 74 | 1 402 | 153 | 146 | 122 | 8.70 |
| DY × SR | 57 | 1 241 | 202 | 191 | 167 | 13.46 |
| DY × DY | 64 | 1 502 | 197 | 151 | 124 | 8.26 |
| *Total* | 275 | 5 983 | | | 650 | 10.86 |

* DG, dwarf green; DY, dwarf yellow; SR, San Ramon

**Experiment 5.4.5—Production of planting material at ISG, for the proposed super seed garden (1986)**

**Selection of palms on fields 1 and 2**

A total of 50 selected *Ambakelle special* palms comprising 23 palms on field No. 1 and 27 on field No. 2 already included in the pollination programme were used as female parents in an intensified programme of hand pollination for production of "*Ambakelle super*" material for planting the proposed super seed garden at Kirimetiyana. The best 15 palms from amongst these were used as pollen donors, in rotation, with each acting as pollen parent for a fortnight.

**Table 5** *Effect on fruit set of pollinations using*

*(i) inactivated pollen and (ii) lycopodium*

*(i) Inactivated pollen used Q on 5 tall, 5 DG and 5 DY inflorescences*

| *Inflorescence type** | | *No. of flowers/buttons/fruits at bagging* | *3 months* | *harvest†* |
|---|---|---|---|---|
| **Tall** | 1 | 17 | 1 | 0 |
| | 2 | 20 | 11 | 0 |
| | 3 | 11 | 1 | 1 |
| | 4 | 37 | 5 | 4 |
| | 5 | 21 | 1 | 0 |
| **DG** | 1 | 26 | 13 | 0 |
| | 2 | 32 | 16 | 0 |
| | 3 | 25 | 13 | 1 |
| | 4 | 21 | 6 | 0 |
| | 5 | 34 | 11 | 0 |
| **DY** | 1 | 18 | 1 | 1 |
| | 2 | 18 | 1 | 0 |
| | 3 | 17 | 1 | 0 |
| | 4 | 15 | 0 | 0 |
| | 5 | 16 | 0 | 0 |

(ii) *Lycopodium used on 7 tall, 4 DG and 4 DY inflorescences*

| | | | | |
|---|---|---|---|---|
| **Tall** | 1 | 18 | 0 | 0 |
| | 2 | 40 | 0 | 0 |
| | 3 | 43 | 0 | 0 |
| | 4 | 48 | 0 | 0 |
| | 5 | 55 | 1 | 0 |
| | 6 | 36 | 0 | 0 |
| | 7 | 21 | 1 | 0 |
| **DG** | 1 | 36 | 2 | 0 |
| | 2 | 30 | 1 | 0 |
| | 3 | 39 | 0 | 0 |
| | 4 | 22 | 0 | 0 |
| **DY** | 1 | 20 | 0 | 0 |
| | 2 | 22 | 0 | 0 |
| | 3 | 36 | 2 | 0 |
| | 4 | 21 | 0 | 0 |

* DG, dwarf green, DY, dwarf yellow

† Harvested fruits had husk only and no shell or kernel, thus not viable seed.

**Selection of palms in field 3**

Selection of palms on field 3 for use in the pollination programme was completed using similar methods with slight modifications. Yield data for 229 palms in field no. 3 over the 16 year period (1965-1981, excluding 1969 for which records were incomplete) had been used to select the 87 best palms, based on mean nut yield and b value (cf. Annual Report 1982) and nut weights had been recorded since 1983 on these 87 palms, marked with yellow bands for ease of identification.

Further selection was based on pick-wise split nut weight records for these palms over the three year period, 1984 to 1986, For each year, palms giving higher-than-average split nut weight for that year were listed. This resulted in 46,45 and 44 palms for the years 1984, 1985 and 1986, respecctively but the palms which performed above average in one year did not always perform well in the others. Palms which performed well in two or more years were selected for use as female parents in the pollination programme and those which did well in all three years were used as pollen donors. There were, as a result, 45 seed palms and 23 pollen donors finally selected on field no. 3 at ISG. Pollen collection was begun during the year but the pollination of palms on this field has not yet commenced.

Table 6 *Results of self pollinations of selected dwarf green (DG) and dwarf yellow (DY) palms, carried out in* 1987

| *Field* | *Form* | *No. of palms* | *No. of inflorescences pollinated* | *No. of bagging* | *flowers/buttons/nuts at 3 months* | *6 months* |
|---|---|---|---|---|---|---|
| 5 | DG | 12 | 159 | 5 615 | 1 535 | 1 186 |
| 9 | DG | 15 | 185 | 5 384 | 990 | 557 |
| 10A | DG | 5 | 46 | 1 215 | 178 | 86 |
| *Total* | | 37 | 390 | | | |
| 10A | DY | 25 | 319 | 9 607 | 1 502 | 917 |

**Selection of palms on field no. 9**

On field no. 9 at the Isolated Seed Garden data for yearly nut yields on tall palms for the period 1975-1983 were tabulated and the mean yield for each palm over the 9 year period was calculated.

All palms having a mean yield of 80 nuts/palm/year for this period were selected and marked with yellow bands for recording of nut weights. A total of 337 such palms were selected out of 659 on this field, and split nut weights recorded from the 3rd pick of 1987. Due to the urgent need for material for planting the special seed garden, the 30 best palms out of these 337, having nut yields 98 were selected for pollen collection. The best of these had a mean yield of 154 nuts/palm/year over the nine year period. Seed palms will be selected later, taking into consideration nut weights as well.

**Programme of pollination**

A total of 600 inflorescences comprising 280 on field no. 1 and 320 on field no. 2 were pollinated during the year. There were 18,119 female flowers at bagging and a minimum 3,600 nuts are expected to result.

Pollinations on selected palms in fields 3 and 9 will be started next year.

**Planting of seedlings**

The seedlings resulting from "*Ambakelle super*" crosses, reserved for planting in the super seed garden were not taken as scheduled as there was some delay in acquisition of the land for this purpose. It has been decided to plant as much of this material as possible at ISG until land is made available for the new seed garden.

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**Experiment 5.4.6—Backcrossing of *dwarf green* palms at ISG, (1987)**

Most of the *dwarf green* palms in the second plantation in field 5 at ISG are now in flower but it is not yet possible to emasculate them as the inflorescences are embedded in the axils of the fronds, making bagging difficult. The entire inflorescences are, therefore, cut away to prevent release of dwarf pollen into the atmosphere.

Some of the pollen from these palms was processed and used in a programme of back crossing which was considered useful for genetic studies. Details are given in Table 7.

*W. M. U. Fernando, M. H. L. Padmasiri, W. B. S. Fernando and M. R. T. Wickramaratne*

**Experiment 5.4.7—Pollinations at ISG, using spicata pollen (1987)**

A whole block of about 50 palms of the *variety spicata* was discovered in a home garden in Unawatuna during a germplasm collection trip to the Southern Province. Pollen from two inflorescences from two such palms were processed in the laboratory. This pollen was issued to ISG for use on selected *tall*, *dwarf green* and *dwarf yellow* palms on an experimental basis. The large number of female flowers and the absence of rachillae may be useful characters if transmitted to a hybrid. It is possible that a hybrid may be produced in which the undersirable characters of frequent breaking of bunch stalk and premature falling of nuts may be absent.

The pollen samples from the two different palms were labelled S1 and S2 . The S1 pollen was used on one *tall* palm (2.55), two *dwarf green* palms (5.6 and 9.17) and three *dwarf yellow* palms (A5, A8 and A22) while S2 pollen was used on one *tall* (1.06), three *dwarf green* (5.10, 5.12 and 9.6) and two *dwarf yellow* palms (A3 and A7). These palms were already included in the pollination programme. They were selected as they all had an inflorescences due for pollination at the time the pollen was available and they also had a generally high setting percentage.

*W. M. U. Fernando, W. B. S. Fernando, M. H. L. Padmasiri and M. R. T. Wickramaratne*

**Experiment 5.5—Establishment of germplasm collections (1988)**

**Experiment 5.5.1—New Variety Block or Crop Museum, Bandirippuwa Estate, Lunuwila (1983)**

Planting of this block was continued as detailed in Table 8 and two casualties were replaced. The block was maintained satisfactorily. The *dwarf yellow* as well as *dwarf green* palms are now yielding fruit.

*I. J. S. Kondasinghe and M. H. L. Padmasiri*

**Experiment 5.5.2—Purification of local (indigenous) germplasm, Bandirippuwa Estate, Lunuwila (1984)**

Planting of this block using progeny from the programme of controlled pollination (selfing or crossing within forms of the different local coconut varieties) on palms in the variety block (field no. 9) at Bandirippuwa was continued. A total of nine *kamandala*. *bodiri* and *navasi* palms were planted in November. Two *dikiripol* seedlings resulting from culture of embryos from nuts with semisolid kernel were planted in this block in December

Table 7 *Backcrossing of dwarf green palms on field No. 5 at ISG*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mother palm No. (1st plantation) | 3649 | 3677 | 3683 | 3715 | 3717 | 3718 | 3754 |
| Pollen parent No. (2nd plantation) | 100 | 134 | 218 | 213 | 40 | 115 | 7 |
| No. of inflorescences | 3 | 2 | 4 | 3 | 2 | 2 | 1 |

Table 8 *Details of planting in crop museum, block No. 5, Bandirippuwa Estate.*

| *Variety and form* | *Source* | *Planting date* | *Seedhole Numbers* |
|---|---|---|---|
| **Aurantiaca** | | | |
| *Rathran thembili* | Colombo (from controlled self pollination in home garden) | 16.11.87 | 30—33 |
| **Typica** | | | |
| *Ranthembili* | B/E (from controlled pollination on field No. 9, BE) | 19.11.87 | 88—89* |
| *Dikiripol* | Weligama (nuts with solid kernel) | 25.05.87 | 92—98 |
| **Improved varieties** | | | |
| Hybrids | | | |
| *DG* × *T* | ISG from directed | 25.05.87 | 106—112 |
| *DY* × *T* | natural pollination | 25.05.87 | 113—119 |

There are now a total of 173 seedlings comprising 45 *bodiri*, 56 *gonthembili*, 39 *porapol*, 14 *ranthembili*, 12 *navasi*, 5 *kamandala* and 2 *dikiripol*. A total of 61 seedlings died during the year; the high casualty rate was due mainly to extensive rat damage due to poor sanitation of the surrounding area, which was subsequently weeded and is now maintained satisfactorily.

*I. J. S. Kondasinghe and H. P. P. H. Pathirana*

**Experiment 5.5.3— Conservation of San Ramon, (1984)**

Two casualties were replaced in the 2 acre block at Bandirippuwa Estate, Lunuwila set up as a "field gene bank" for *San Ramon*, using progeny from *San Ramon* x *San Ramon* crosses carried out on field no. 16 at Bandirippuwa. Two more seedlings were planted, bringing the total to 94 palms on this block, 47 of which are of the green colour form and 47 russet.

A further block for conservation of *San Ramon* was established at Andigama Farm Giriulla, in a part of the Puras block. One hundred planting holes were prepared but *San Ramon* x *San Ramon* seedlings were available only for 77 holes. *Ambakelle tall* was used in the guard rows. The balance 23 holes will be planted as and when material is available.

*I. J. S. Kondasinghe and H. S. G. Kularatne*

**Experiment 5.5.4—Self pollination of dwarf palms at Ratmalagara Estate (1984) and establishment of "field gene bank" for dwarf palms at Bandirippuwa Estate, Lunuwila (1987)**

A "field gene bank" for dwarf palms was established this year in an extent of about 6 acres on the 50 acre block at Bandirippuwa. A total of 116 seedling comprising 35 *dwarf green*, 29 *dwarf yellow* 15 *dwarf red* from the self pollination programmes at Ratmalagara and ISG and 37 *Ambakelle special* for the guard rows were planted in this block. There were 4 casualties, subsequently.

A total of 31 palms comprising 11 *dwarf green*, 12 *dwarf* red and 8 *dwarf yellow* (of which 4 were with bole and 4 without) were included in the programme of self pollination at Ratmalagara, carried out in 1986. A total of 1,157 dwarf nuts of which 306 were green 577 red and 274 yellow, were harvested during 1987 and laid in the Research nursery at Bandirippuwa. Seedlings from these will be used for planting the field gene bank at Bandirippuwa next year.

*I. J. S. Kodasinghe, W. G. A. Ratnasiri and M. H. L. Padmasiri*

**Experiment 5.5.5—Germplasm from other countries (1985)**

No progress was made regarding the import of exotic seed material from Indonesia.

The programme of controlled pollination for purification and multiplication of exotic material already available in the country was begun in May. Six *Cameroon Red Dwarf* palms and seven *Brazilian Green Dwarf* palms, seednuts of which had been introduced from the Ivory Coast, were included in this programme.

**Cameroon Red Dwarf palms (CRD)**

A total of 47 inflorescences were bagged for selfing and 986 female flowers were present at bag removal, giving a mean of 21 per inflorescence. Setting varied over the year ranging from 17.7% in May to 41.3% in July. Thirty one young nuts were lost due to theft during the latter part of the year. Contamination by ants was often encountered and BHC powder mixed with sand was used as a control measure.

**Brazilian Green Dwarf palms (BGD)**

Although pollination of these palms was begun concurrently with the programme for *Cameroon Red Dwarfs*, the percent setting was found to be much lower in the green dwarf, ranging from 2.9% to 15.35%. On investigation, it was found that in the BGD there was restricted intraspadix overlapping as most of the male flowers were shed prior to receptivity of female flowers. However, these palms showed interspadix overlapping, the female phase of an inflorescence often overlapping the male phase of the next inflorescence. This is in accordance with the findings of Rognon (1976) and Sangare *et al.* (1978) as reported by Ohler (1984) and has been categorised by them as *semidirect autogamy*. It is of interest that some of the *dwarf yellow* palms on our plantations also fall into this category.

It was considered necessary to collect and process the pollen from the palms showing semidirect autogamy and then use them in pollination rather than merely bag and shake the inflorescence, in order to increase seed set in *dwarf* X *dwarf* crosses. This was carried out towards the end of the year but data on seed set are not yet available.

*I. J. S. Kondasinghe and H. S. G. Kularatne*

**Experiment 5.5.6—To survey, collect, evaluate and utilise coconut germplasm (1986)**

**Experiment 5.5.6.1—Collection of germplasm of the commercial tall variety (*Typica typica*)**

Collection of material for both breeding pruposes and reserve collections was limited by the available space for planting such collections. Although it was tempting to collect as much as possible of existing diversity in order to preserve all actually or potentially valuable alleles which may be rare and/or geographically restricted, this was not possible as it is bound to make the collection too large and diffuse for use. It was decided, after preprospection, to carry out collection of tall material in two stages:

(1) **Biased Collections** from areas where coconuts are grown on a plantation scale and material is likely to have one source, and from which intensive collections would be made. These would be based on locality and descent and each would form a distinct accession which may be used for breeding purposes after evaluation.

(2) **Random collections** from scattered small holdings where there is little available information on sources of material and from which extensive collections (staggered samples ) would be taken. These would constitute reserve collections for conservation purposes as they may contain rare alleles and those which may be able to fill unforeseable needs.

The former was embarked upon during the year. During the preprospection, certain estates or groups of estates were found to have had a tradition of planting their own material, raised in their own nurseries on site, using seed from their own selected mother palms. From amongst these estates, those populations likely to be different from others due to some special characteristic were identified. One hundred palms were taken at random from those estate populations and nut samples collected for nursery and fruit component studies as detailed by the International Board of Plant Genetic Resources (IBPGR). The format for collection record descriptors issued by IB GR was modified in keeping with our requirements.

Collections were made from Moorock Estate and Pitiyakande Estate, both in the Mawathagama area of the Kurunegala district and from Mudunawatte Estate, Wellawa, also in the same district. Other estates already earmarked for collection are Palugaswewa Estate, Melsiripura Group, Keenakelle Estate and Maradawila Farm.

**Moorock Estate**

Moorock is a private estate in Mawathagama which has carried out palm selection into the fourth generation, based not only on nut numbers but also on split nut weights, thickness of husk and thickness of kernel.

Seednuts were originally introduced by Mr. Warburton Gray who was Superintendent and subsequently visiting agent on this estate, and planted in 4 ha (10 ac) on field no. 3 (old plantation). The first selections from this material were done in 1941 on the 15-20 year old F1 palms on this plantation, under the direction of the visiting agent. During this time, 3,500 nuts/acre was considered to be a high yield. Preliminary selection of palms was on visual characters after which each bunch was picked and the number of nuts recorded. Thickness of husk was determined by passing a penknife through the husk. Nuts were split, water drained and the split nuts weighed and palms with over 908 g (2 lb) split nut weights were chosen. Thickness of kernel was then determined and palms with more than 13 mm (1/2 in) kernel thickness selected. Some palms were rejected on the above characters. The selected palms were marked as "N" palms as nuts harvested from them were used as seednuts and laid in the nursery.

Seedlings raised from these were used for planting fields 1,4,5, and part of 3 (6.5 ha or 16 ac). These constitute the second filial or F2 generation. Field no. 2 was not underplanted at that time as it was bearing well.

A Similar selection was carried out on the underplantations (F2) in fields 3 and 4 in the 1970's and more N palms were marked. Seednuts from these were used for underplanting field no. 2 (F3) in the late ninteen-seventies (after 1975/76).

During 1982, Moorock Estate was included in the mother palm selection scheme of CRI. Palms had been selected by CRI and these included palms from both F1 and F2 generations. Some of the trees selected by the estate had been rejected by CRI as having nuts which were too large. In January 1982, during which time seednuts were rejected if extra small, the selection percentage at Moorock was as high as 83.5, the best of all estates according to records of that time. It was then realised that nuts from Moorock seemed

to be larger and heavier than those on other estates and the kernel also appeared thicker. Material from Moorock was hence selected for testing as a separate cultivar.

In March one hundred palms were randomly selected from fields 1,3 and 4. (Field 5 had by this time changed ownership). One nut per palm was collected for fruit component studies and nuts were also collected from these palms for laying in the nursery for planting the collection. Palm characters were recorded on 10 of these palms.

A second collection of nuts for the nursery was made at a later pick, from the same 100 palms.

**Pitiyakande Estate**

In a quest for lands suitable for use as sources of seednuts, Pitiyakande Estate was identified in early 1985. This estate was found to be promising on inspection and the yield data showed that nut production on this estate was much higher than average. Whilst attempting to select plus palms, it was found that although the palms were bearing profusely the majority of palms did not meet the standards as far as weight of nuts was concerned. For instance on field no. 3, Pitiyakande Division, while 85.7% of the palms had over 14 nuts per palm per pick at the June 1985 pick, only 19% had the weight of 3 husked nuts equal to or greater than 4.5 lb. Moreover, those which did meet this criterion for weight were often in valleys or near dwellings. The situation was similar in Bridestowe Division, which is another division of the same estate.

Perusal of the Pitiyakande files yielded some interesting information. There were several reports complaining of the large number of nuts that go to a candy of copra and a letter from Superintendent, Pitiyakande to the visiting agent, Mr. Warburton Gray in 1951, saying he envied the yield and cost of production at Moorock and hopes that Pitiyakande will do the same. It was also recorded that there were coconut nurseries at Pitiyakande and Bridestowe and they supplied other estates in the region as well. It appears, therefore, that palms at Pitiyakande have always been profuse bearers but that the nuts were smaller than average. Consequently, it was decided to make a collection of germplasm from this estate.

In June one hundred palms were selected at random from fields nos. 2, 3 and 4, taking care to leave out fields with hybrid plantations and parts of fields adjoining them. Two nuts were collected from each palm, one for fruit component studies and one for laying in the nursery. Palm characters were recorded on ten palms.

A second collection of nuts from the same 100 palms was made at a later pick for laying in the nursery.

**Mudunwatte Estate, Wellawa**

This estate, situated in a drier part of Kurunegala belonged to Mr. Noel Daniels who had selected palms over the years for drought tolerance. These selected palms had had at least 10 nuts at each pick i.e. a minimum of 60 nuts/palm/year, even in years when coconut yields were generally below average due to severe drought during the preceding year and most palms on the estate had little or no nuts. There was a total of 16

such selected palms of which 12 were used for the present study, the others being rejected for various reasons. As there were only 12 palms, all nuts harvested from them were collected of which 36 were used for fruit component studies and 122 for laying in the nursery. Palm characters were recorded on all 10 palms. A second collection of nuts for the nursery was made from the same 12 palms at a later date.

**Results**

Results for the comparison of the three populations on the basis of fruit characteristics inflorescence characteristics and some other characters of interest are given in Tables 9,10 and 11 respectively.

**Table 9** *Comparison of fruit characteristics of three populations in Kurunegala district*

| *Characteristic* | *Moorock* | *Pitiyakande* | *Wellawa* |
|---|---|---|---|
| Fruit weight (g) | 1388.60<br>800—2640 | 1315.3<br>750—2325 | 1078.6<br>720—1490 |
| Husk weight (g) | 678.30<br>340—1640 | 674.38<br>350—1300 | 498.89<br>320—830 |
| Nut weight (g) | 710.30<br>400—1200 | 640.75<br>400—1150 | 578.61<br>340—920 |
| Split nut weight (g) | 535.85<br>300—840 | 495.85<br>310—800 | 434.03<br>290—620 |
| Volume of nut water (ml) | 189.99<br>52—372 | 143.97<br>22—360 | 125.44<br>45—242 |
| Thickness of shell (mm) | 3.88<br>2.3—6.3 | 3.71<br>2.3—7.0 | 3.38<br>2.—4.7 |
| Thickness of kernel (mm) | 13.32<br>10—16.7 | 12.77<br>10.3—15.6 | 12.79<br>10—16 |
| Fresh weight of kernel (g) | 374.75<br>220—620 | 311.10<br>100—475 | 293.33<br>180—470 |
| Dry weight of the kernel (g) | 210.92<br>94.6—353.4 | 170.8<br>26—276.3 | 150.4<br>81—272.6 |

Figures indicate mean value and range for each characteristic.
Recordings made in June 1987 were from 100 palms per population at Moorock and Pitiyakande and 36 palms at Wellawa

**Table 10** *Comparison of inflorescence characteristics of three populations in Kurunegala district*

| *Characteristic* | *Moorock* | *Pitiyankande* | *Wellawa* |
|---|---|---|---|
| Length with spikelets (mm) | 745.50<br>540—1020 | 717.50<br>490—840 | 691.50<br>600—800 |
| Length without spikelets (mm) | 92.00<br>0—250 | 72.50<br>0—120 | 76.50<br>0—170 |
| Average length of a spikelet (mm) | 426.20<br>370—514 | 426.25<br>336.5—510 | 407.70<br>358.5—487.5 |
| Spikelets/bunch | 31<br>21—42 | 30.2<br>20—39 | 30.40<br>24—38 |
| Female flowers in 1st bunch | 16.42<br>0—65 | 23.27<br>1—119 | 19.33<br>9—28 |
| 2nd bunch | 14.00<br>0—54 | 18.63<br>0—114 | 17.92<br>0—28 |
| Total no. of female flowers | 30.42<br>3—113 | 41.90<br>4—233 | 37.25<br>15—56 |
| Total resulting fruits | 10.66<br>2—27 | 13.72<br>2—32 | 11.50<br>2—23 |

Figures indicate mean value and range for each characteristic
Recordings made in June 1987 were from 10 palms per population

**Table 11** *Comparison of some other characteristics of interest in three populations in Kurunegala district*

| *Characteristic* | | *Moorock* | *Pitiyakande* | *Wellawa* |
|---|---|---|---|---|
| Height of palm (m)* | | 13.69<br>9—18.1 | 13.56<br>9.45—16 | 17.06<br>13.9—20.27 |
| Nuts/pick* | | 11<br>2—27 | 14<br>2—32 | 11<br>2—23 |
| Size and shape of nut** | Polar circumference (cm) | 62.8<br>52.5—75 | 59.25<br>48.5—76 | 54.32<br>42—64 |
| | Equatorial circumference (cm) | 53.93<br>42—69.5 | 49.97<br>42—63 | 48.00<br>39.5—55.5 |
| | Polar/Equatorial circumference | 1.17<br>0.99—1.39 | 1.19<br>1.04—1.42 | 1.14<br>0.87—1.30 |

Figures indicate mean value and range for each characteristic

* Recordings were made in June 1987 from 10 palms per population

** 100 nut samples from Moorock and Pitiyakande and 36 nuts from Wellawa were used.

It is noteworthy that although Pitiyakande palms were profuse bearers of relatively small nuts while Moorock yielded nuts which were larger than average, the total kernel weight per palm was similar for the two populations. If these characters are found to be transmitted to the progeny, accessions from these two populations would form very useful breeding material for the future.

The study continues.

*M. R. T. Wickramaratne, W. G. A. Ratnasiri and P. Kariyawasam*

**Experiment 5.5.6.2—Collection of germplasm of different forms of coconut: (a)** ***San Ramon*** **(b)** ***dwarf*** **forms (c) indigenous** ***tall*** **forms**

Collection of this material was simpler than collecting tall germplasm of the variety *typica typica* as identification of forms is possible visually, to a large extent, and the sources of collection were limited.

(a) *San Ramon* germplasm was collected from Clovis Estate, Uhumiya, which is believed to have one of the oldest *San Ramon* plantations in the country, with material originally introduced from the Philippines (Dr. D. V. Liyanage, pers. comm.). This estate has now been partitioned into blocks and sold. Collections were made from four such blocks.

(*b*) *Dwarf forms* Negotiations are in progress for collecting from Mirishena State Plantation, Bulathsinhala. This estate, formerly managed by Hayleys and now by SLSPC, has a 0.8 ha (2 ac) block alongiside the Kuda Ganga, planted mainly with *green dwarfs* and a few *talls* . There is a total of about 200 palms planted in 1951/52. The seedlings are said to have been brought from the Kalutara area by boat.

Collection will also be done from Johanawatte and surroundings in the Pallama area. It appears that dwarf palms were first imported to Sri Lanka from Johore in Malaysia by Mr. Lambert M. M. Dias and planted in crown land close to Johanawatte (Correspon dence from Mr. L. M. Maalyn Dias to Dr. M. A. P. P. Manthriratne in May 1974). There was a large block of dwarf palms of the different colour forms at Johanawatte but this again is said to have been blocked out now.

Collections from the *dwarf green* block at Kundasale were not possible as the nuts are all picked for drinking, before they are completely mature, and it is not possible to stop this practice.

(c) **Indigenous tall forms** The indigenous tall forms of coconut are found mainly in the Southern regions of the island. A few palms of the forms *bodiri, porapol* and *ranthembili* were located on explorations to the South and collections made. A few *navasi* palms were located in other regions of the country and collections made from them also.

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**Experiment 5.6—Isolation of genotypes showing drought tolerance, Passekudah Farm, Kalkudah (1983)**

**Experiment 5.7—Evaluation of the performance of FI progenies of *tall* (OP) and *dwarf* X *tall* on the East Coast, Passekudah Farm, Kalkudah (1981)**

**Experiment 5.8—Identification of drought tolerant palms, Passekudah Farm Kalkudah (1982)**

No useful information can be obtained from these trials due to continued disturbances in the area.

*M. R. T. Wickramaratne*

**Experiment 5.9—San Ramon crosses, Bandirippuwa Estate, Lunuwila (1984)**

Seedlings resulting from these crosses were used for planting *San Ramon* field gene banks at both Bandirippuwa and Andigama (cf. Experiment 5.5.53) . The inflorescences pollinated in 1986 yielded a total of 150 nuts.

The smooth progress of the crossing programme was impeded during 1987 due to shortage of labour and loss of nuts by theft. During the period May to July, 11 inflorescences were pollinated and setting percentage ranged from 27.5 to 68. The programme was discontinued in August and restarted in September. A further 19 inflorescences were pollinated over September to December. A total of 76 nuts produced from the crossing programme were lost during August and September, just prior to harvest

*I. J. S. Kondasinghe and H. S. G. Kularatne*

## PROJECT 6—PRODUCTION OF HIGH QUALITY SEEDS AND SEEDLINGS

### Experiment 6.1—Study of yield fluctuations in the Isolated Seed Garden, Ambakelle (1982)

This study was completed with the assistance of Mr. Richard Coe, Consultant Statistician from the University of Reading. The resulting paper is in the manuscript stage.

*M. R. T. Wickramaratne, W. M. U. Fernando and W. B. S. Fernando*

### Experiment 6.4—To test effciency of seednut selection, Bandirippuwa Estate, Lunuwila (1982)

The results of this study were published in collaboration with Mr. Richard Coe Consultant Statistician, in *Cocos* as a paper entitled "Evaluation of criteria for the selection of seed coconuts." The findings presented to the Research Committee are as follows :

In the production of seednuts, it is customary to harvest the seed palms and then select seednuts using certain criteria. In the past, it had been the practice to select only those nuts of uniform shape (nearly-round) and size (approx. 7 in. short axis and 9 in. long axis) which were dead ripe. This resulted in only 60% of the nuts being used as seednuts. In 1982, in the absence of any definite data the Consultant in Breeding recommended that only immature, empty, exceptionally small or outsized nuts be rejected and all others used as seednuts, thereby increasing percentage used as seednuts to 80%. It was also decided to commence this study, which showed that the above criteria for seednut selection still permit a substantial number of unsuitable nuts to reach the nurseries and in addition eliminate a not inconsiderable number of nuts which are capable of producing vigorous seedlings. Frequency of the different types of rejected nuts together with the percent issuable seedlings which resulted from them are given in Table 12. The investigation was carried out using unselected nuts from plus palms at Keenakelle Estate, Mudukatuwa, and tall palms at ISG. Results are summarized below.

(1) Of the total nuts harvested, 66.5-69.5% produced seedlings suitable for issue.

**Table 12** *Frequency of the different types of rejected nuts together with the percent issuable seedlings which resulted from them*

| *Causes of rejection of nuts* | *Percent in heap* | *Percent issuable seedlings* |
|---|---|---|
| 1. Small | 0.92 | 72.7 |
| 2. Small with reduced nut water | 0.83 | 80.0 |
| 3. Reduced nut water | 3.08 | 70.3 |
| 4. Empty (*puhu*) | 2.67 | 34.4 |
| 5. Immature (*kalati*) | 2.25 | 40.7 |
| 6. Immature and fallen (*kuruwal*) | 0.42 | 60.0 |
| 7. Mis-shapen | 0.33 | 100.0 |
| 8. Damaged | 0.58 | 28.6 |
| 9. Fallen nuts from previous harvest | 0.08 | 100.0 |
| *Total* | 11.16 | 55.22 |

(2) Of the balance 33.5% to 30.5% (rejected at seedling stage), as much as 83-86% had been selected as seednuts.

(3) Of the total non-germinations 69-77%were from those selected as seednuts

The fate of nuts rejected as unsuitable for use as seednuts, which formed part of this study showed that:

(1) 54-57% produced seedlings suitable for issue. This shows that over 50% of nuts considered unsuitable produced vigorous seedlings.

(2) Most (72.4%) of those rejected as being too small, having reduced nut water or both were found to yield seedlings suitable for issue.

(3) All mis-shapen nuts produced seedlings suitable for issue. Damaged nuts did so sometimes (depending on extent of damage?).

(4) Even "empty" or immature nuts yielded seedlings suitable for issue.

It appeared that the criteria for rejection (or selection) used were inadequate and more definite criteria were sought. However, no strong relationships could be found between germination or time to germinate and any of the easily gauged variables such as size shape, weight, husk thickness etc. Although there were some statistically significant relationships, these were too small to be of any practical value.

Seednut selection may, therefore, be dispensed with and all nuts harvested from selected seed palms (or palms in seed gardens) laid in the nursery. Non-germinations should be removed five months from laying and a rigid selection of seedlings carried out at seven months, in the nursery, as at present.

This would increase seedling issues by about 10% and cut down time and labour spent on seednut selection. Costs and benefits of dispensing with seednut selection are as follows :

1. An overall increase of 6% in seedlings suitable for issue-So seedling recovery goes up from 63,000 to 69,000 for every 100,000 nuts laid.
2. Reduction in expenditure on :
   * labour wages (50 labour units per 100,000 selected nuts)
   * travel and subsistence of supervisory staff
3. Saving of time and energy which may be used for other purposes. (10 days for selection of 100,000 seednuts at 5 labourers per day)
4. Increase in transport costs is minimal :

   One lorry load (approx. 4,000 nuts ) per 100,000 harvested i.e. one additional lorry load for every 25 loads.

In view of the above findings, the Coconut Research Board permitted the selection of all nuts, except mis-shapen nuts, as seednuts.

*M. R. T. Wickramaratne and M. A. S. Fernando*

**Experiment 6.5—Study of variation in seedling characters of different coconut types/cultivars, ISG, Ambakelle (1982)**

The trial was repeated using *dwarf green, dwarf yellow, dwarf green* × *tall, dwarf yellow* × *tall* and *tall* × *tall* all produced at ISG, Ambakelle. The trial is in progress.

*W. M. U. Fernando, M. H. L. Padmasiri and H. S. G. Kularatne*

**Experiment 6.6—Effect of maturity of *dwarf* X *tall* hybrid nuts on sprouting, ISG, Ambakelle (1982)**

Data analysis was completed and a paper is under preparation.

*M. R. T. Wickramaratne, W. M. U. Fernando. M. H. L. Padmasiri and M. A. S. Fernando*

**Experiment 6.7—Evaluation of criteria used in plus palm selection (1983)**

Computerisation of the data is still underway but a preliminary inspection of results suggests that the present method of plus palm selection is not entirely satisfactory. It is unlikely that scrutiny of palms, nut numbers and nut weights at only a single pick can successfully identify those palms which are usually high yielders on a block. This will, perhaps, be confirmed after data analysis and an alternative suggested.

*M. R. T. Wickramaratne, P. Kariyawasam, M. A. S. Fernando and H. S. G. Kularatne*

## 3. MISCELLANEOUS EXPERIMENTS

### 3.1 Fruit component studies (1983)

The data set for fruit component studies on varieties of coconut in Sri Lanka, collected over the period 1983-1986 was found to be too large and complex to handle with the facilities available to us. It was, therefore offered to Mr. Richard Coe, Consultant Statistician from Reading University, for analysis overseas and formed part of a thesis submitted to Reading University for the degree of Master of Science by Ms. Ruth Butler.

The information extracted from this data set is very promising and is likely to form a basis for differentiating between similar pairs of varieties such as *San Ramon* and *kamandala, king coconut* and *navasi thembili*, or *gonthembili* and *dwarf yellow* which are often easily confused with each other and are difficult to distinguish.

There was no evidence to suggest that the different varieties behaved similarly with respect to picking times, both in the overall fruit size or the content of each fruit. Some varieties were more stable over picks than others and some were stable in some of the consituent parts but not others. Some varieties consistenly produced larger fruit or more meat than others.

A paper is under preparation.

*M. R. T. Wickramaratne, W. M. U. Fernando and W. B. S. Fernando*

### 3.2 Trials at the East Coast.

**Experiment G 3.8—Evaluation of the performance of tall x tall, dwarf x tall and Moorock tall in the dry zone, Minneriya (1983)**

Visits were not possible during the year.

*M. R. T. Wickramaratne*

### 3.3 Experiment G 1.3—Flowering and cropping patterns in dwarf palms (1983)

The objective of this study and method of data collection were outlined in the Annual Report of 1983. The size and structure of the data set, consisting of records of patterns of flowering and nut production of 100 dwarf green and 100 dwarf yellow palms over a three year period, necessitated the use of computer packages for analysis. This data set was also given to Mr. Richard Coe, Consultant Statistician from Reading University for assistance in analysis, and formed part of the Master's thesis of Ms. Ruth Butler.

The initial analysis showed clearly that the two colour forms do not have similar cropping/dormancy patterns. Within each variety, palms do not follow identical, or even nearly identical patterns with respect to time. More information can be extracted from this data set when the data presently under collection becomes available.

This study is in progress.

*M. R. T. Wickramaratne, W. M. U. Fernando and M. H. L. Padmasiri*

### 3.4—Study of performance of improved cultivars (CRIC 60 and CRIC) 65 on a plantation scale 1985)

The study received an impetus by the project for the assessment of experience with new varieties of coconut, for Asian and Pacific Coconut Community, undertaken towards the end of the year. Since this latter had to be done according to a time schedule and completed within a specified time, many more blocks were surveyed than would otherwise have been done.

**Identification of lands**

There were five sources of information for identifying lands where improved cultivars of coconut had been planted, as follows :

*a.* Five-acre observation plots, established 1964-1979
*b.* Seedling issues register at CRI, 1981 to 1984
*c.* Information from officers of CCB
*d.* Response to advertisement calling for growers of improved cultivars.
*e.* Other sources.

a. **Five-acre observation plots** These plots had been established island-wide over the period 1964-1979. There was a total of 95 such plots, the distribution of which is given in Table 13. Unfortunately, this observation trial was badly disrupted by land reform activities in the mid-serventies and many of the plots had been neglected or even abandoned. Fifty six seemed worth following up and holders were contacted by post. Thirty one responded, of which only 22 were positive. Some of those who did not respond were also contacted and 19 plots inspected during the year.

**Table 13** *Distribution of 5-acre observation plots, established 1964—1979, for assessment of improved cultivars.*

| *Province* | *District* | *No. of. plots* |
|---|---|---|
| North Western | Puttalam/Chilaw | 20 |
| | Kurunegala | 19 |
| Western | Colombo/Gampaha / Kalutara | 22 |
| Central | | 3 |
| Southern | Galle/Matara | 7 |
| | Hambantota | 1 |
| North Central | | 3 |
| Sabaragamuwa | Kegalle | 7 |
| | Ratnapra | 3 |
| Uva | Badulla | 2 |
| Northern | Jaffna | 8 |
| Eastern | | *nil* |
| | Total | 95 |

Although the original plan had been to issue 320 seedlings comprising 64 *tall X tall* 128 *tall* × *dwarf* and 128 dwarf *tall* for each plot, we found on inspection that the number and proportion of the different cultivars varied, perhaps according to availability of land and of planting material. Owners were often uncertain of the type of material they had planted and of the exact location of each variety on their land. On several occasions, identification of the varieties planted proved difficult. Furthermore, some of the plots were in areas quite unsuitable for coconut cultivation.

**b. Seedling issues register** A total of 90 letters were sent out to growers who had taken seedlings from CRI nurseries, 62 of whom had taken $T \times T$ and 28 $D \times T$. Only 15 responses were received, 13 of which were positive. Eleven of these sites were inspected.

**c. Information from officers of CCB** Very useful information regarding plantations of improved cultivars was obtained from the CCB officers and about 9 lands listed by them were inspected.

**d. Response to advertisement** Seventeen responses were received to advertisements in the national newspapers calling growers of improved coconut cultivars. Eight of these lands were inspected.

e. **Other sources** Six holdings, the addresses of which were received from other sources, were also inspected.

Thus a total of about 53 holdings were inspected during the year and performance of the improved cultivars *CRIC* 60 and *CRIC* 65 was found to be very variable. There were wide differences in performance depending on location differences, especially rainfall, soil type and terrain and even palms of a single cultivar at a single site, especially *CRIC* 65, showed considerable variation. On occasion it was difficult to distinguish between *CRIC* 60 and *CRIC* 65.

Although *CRIC* 65 had the advantages of early flowering and heavy bearing, the general consensus of opinion was that this cultivar was unsatisfactory as it is vulnerable to drought and there is heavy premature nut fall, bunch and all. The experience with *CRIC* 60 was relatively less but this cultivar seemed more satisfactory.

A full report, together with results of the questionnaire will be available when the data from the sruvey have been processed and analysed.

*M. R. T. Wickramaratne, I. J. S. Kondasinge and P. Kariyawasam*

**3.5 Effect of vertical/horizontal placement of nuts on growth of seedlings (1986)**

This trial was postponed due to lack of time and lower priority for this study.

*M. R. T. Wickramaratne*

**3.6 Identification of additional source material for seednuts**

A method of identifying additional source material for seednuts in order to meet the anticipated short fall consequent to the adverse weather conditions of the last two years was proposed.

The proposed method is as follows :

1. Select blocks with satisfactory yields in marginal areas and those outside the coconut triangle. This is in view of the possible existence of ecotypes resulting from selective action of the harsh or less than ideal environment, particularly in Hambantota, Melsiripura and Puttalam. Yield standards will be decided based on mean yields in the area concerned.
2. Ensure that the blocks are free of pests and disease.
3. At the next pick, mark all low yielding palms (10-15% of the block) based on nut counts.
4. Repeat step 3 at two or three subsequent picks, if time permits.
5. Have nuts picked from marked low yielders and hand them over to the estate. This should remove nuts from 10—50% palms on the block but should leave more than 50% of the total harvest still on the block .
6. Harvest the remaining palms and collect the nuts as seednuts.

Advantages of the method :

1. **As compared to block nuts.** These will be superior to block nuts as the very poor yielders will not be used as seed palms.

2. **As compared to plus palm nuts :**

   *a.* It is not advisable to select plus palms in a year when yields are low, so this is an alternative method.

   *b.* The initial selection will consume less labour, time and funds as there is no weighing of husked nuts involved.

   *c.* The selection may be checked on at least two subsequent picks, so may be more reliable than plus palms.

   *d.* There will be more selected palms on a single block-so facilitates management and transport of seednuts.

   *e.* Selection of lands in the drought-prone areas will yield material for testing if ecotypes exist. Hence of research value.

This method has already been approved by the authorities and will be put into practice in 1988.

*M. R. T. Wickramaratne and P. Kariyawasam*

### 3.7 Variation in nut numbers and nut weights (1987)

Yield records available at ISG for nut counts for each of 87 palms on field no 3 and husked and split nut weights of upto 5 nuts per palm over 18 harvests for the period 1984-1986 were used in this study, to determine relationships among total yield of coconut and its two main components, the number of nuts and the mean (husked and split) nut weights. Their variation under stress and non-stress conditions, year to year variation and seasonal variation within years were also investigated.

Nut weights were found to be generally more stable than nut numbers. Nut numbers showed considerable variation from harvest to harvest even in a single tree while nut weights were much more consistent as a rule. Total yield showed high correlation with nut numbers.

It was clear that evaluation of yield potential from single harvest data is not to be recommended. Using records of nut numbers for just a few years only could also be injudicious. In view of the wide fluctuations of nut numbers over harvests, nut numbers may have to be recorded for longer periods before realistic evaluation may be carried out. For nut weights, on the other hand, it appears that about three years records may be sufficient. This shorter time period for collecting nut weight records is particulary useful because recording of husked nut weights or husked and split nut weights of palms in the seed garden results in a loss of potential seed nuts.

It appears that palms to be selected for high yield of total copra should be evaluated initially on number of nuts over a longer period of years and then may subsequently be evaluated further based on nut weights.

A paper in collaboration with Mr. Richard Coe, Consultant Statistician from Reading University, is in the manuscript stage.

*M. R. T. Wickramaratne, W. M. U. Fernando and W. B. S. Fernando*

### 3.8 Transmission of colours in coconut crosses (1987)

It was decided to use data available from the San Ramon crossing programme for a preliminary study on the transmission of colours in coconut. This variety was chosen for the study as it has three clearly discernible colour forms in Sri Lanka, namely green, orange green (*bronze*) or intermediate form and brownish red (*russet*). The intermediate form ranges in colour and is less easily identified; consequently it had originally been excluded from the crossing programme but has subsequently been included and results from these crosses are likely to yield further information.

Available data showed that only the *green* and *russet* forms had been used initially in the crossing programme. There was a total of 94 progeny planted in the block of which 47 were *green* and 47 *russet*. Of the 47 *russet*, 46 were the offspring of *russet* × *russet* while one was the result of *russet* × *green* where *green* was the pollen parent. Of the 47 *green*, 37 were the offspring of *green* × *green* while ten were the result of *russet* × *russet* crosses. Results are summarised in Table 14.

**Table 14** *Transmission of colours in San Ramon * San Ramon crosses*

| *Seed parent* \ *Pollen parent* | *green* | *russet* |
|---|---|---|
| green | 37 green | — |
| russet | 1 russet | 46 russet<br>10 green |

It appears that *green* × *green* gives only *green* progeny while *russet* × *russet* usually gives *russet* but may also give *green*. There was only a single progeny from *russet* × *green* and none from the reciprocal crosses, hence it is inconclusive. Perhaps *russet* is dominant to *green* but colour inheritance seem to be polygenically controlled as there is a whole range of the intermediate form.

The study continues.

*M. R. T. Wickramaratne and I. J. S. Kondasinghe*

### 3.9 Study of round and oblong fruits (1987)

A preliminary study on fibre content of round and oblong shaped coconuts in Sri Lanka tall palms had shown that oblong fruits gave as much as 43 kg more fibre per 1000 fruits than round fruits (Ratnayake, 1985). If one can conclude that palms with oblong fruits yield more fibre than those with round fruits, then it may be advisable to recommend the cultivation of palms with oblong fruits in areas where fibre mills are situated.

Scrutiny of the data from the above study showed that the increased fibre yield from oblong fruits was largely due to the greater weight of husk rather than due to a higher fibre content in the husk. Since total fruit weight was not available, it was not possible to determine from this data whether the greater husk weight in oblong fruits was the result of having larger fruits or merely a higher husk content. Available data from ISG was used to investigate this further.

The study is in progress.

*I. J. S. Kondasinghe and W. B. S. Fernando*

## 4. THE ISOLATED SEED GARDEN, AMBAKELLE

**4.1. Extents and details of planting** are given in Table 15 and classification of palms is as given in Table 16. There are a total of 10,875 palms in bearing comprising 7,256 tall, 2,309 dwarf green and 1,310 dwarf yellow.

**4.2 Rainfall** Table 17 gives rainfall intensity and distribution for 1987 with figures for the previous year and the 10-year average (1977-1986) for comparison. Total rainfall for the year was 1308.8 mm. Although this was more than received during the preceding year, it still falls short of the 10 year average by 140 mm. The number of days on which it rained was much lower than average and even lower than that of 1986, being only 88 days for the whole year. The number of wet days (rainfall $\geqslant$ 1 mm) was only 84.

The year started badly, with a very dry first quarter with only 5 wet days as compared to an average of 11 for the last 10 years and 16 in 1986. The total rainfall for this period was only 28 mm for 1987 as compared to the 10-year average of (168.82 mm and 180.2 mm in 1986). The South west rains were also disappointing and a relatively dry intermonsoonal period followed. This is likely to result in very low crops during the first half of 1988.

The North-east rains were encouraging with unprecedented rains in September. The rains in October were also exceptionally high, the highest in October since 1978. However, the monsoon did not continue as expected but ceased abrupthy with only 143.2mm in November which is much lower than average for that month and little or no rain in December.

The heavy rain in September and October may cause an increase in crop toward the end of 1988 but resulted in an interruption of the fertilizer programme scheduled for 1987.

**4.3 Crops** Total crop figures for 1986 and 1987 together with the 10-year average for 1977-1986 are given in Table 18. As expected, based on rainfall figures of the preceding year, the crops in the first half of the year were much higher than average and the reduction in crop was from the fourth pick onwards. Although the total crop of 760 943 was a little higher than the 10-year average it was lower than that for the last two years. The percentage drop from 1986 was 10%.

**Table 15** *Extent and details of planting, Isolated Seed Garden*

| *Field no.* | *Extent** ac | ha | *planting material* | *Planting distance** and system* | *Planting date* |
|---|---|---|---|---|---|
| 1 | 4.5 | 1.82 | Tall | 26 Equilateral triangular | Dec. 1955 |
| 2 | 4 | 1.62 | Tall | 26 x 18 Hedge | Nov 1956 |
| 3 | 4 | 1.62 | Tall | 26 x 22 Rectangular | Nov 1956 |
| 4 | 34 | 13.80 | Tall | 26 Equilateral triangular | Nov 1956/57 |
| 5 | 7 | 2.84 | (i) dwarf | 22 x 18 Triangular | Nov 1959 |
| | | | (ii) Tall and dwarf | 24 x 24 Square 22 x 18 Triangular | Dec 1983 |
| 6 | 20 | 8.10 | Tall | 25 Equilateral triangular | Nov 1960 |
| 7 | 20 | 8.10 | Tall | 24 x 18 Hedge | Nov 1961 |
| 8A | 10 | 4.05 | Tall | 25 x 25 Square | June 1962 |
| 8B | 5 | 2.03 | Tall | 25 x 25 Square | Nov. 1962 |
| 8C | 5 | 2.03 | Tall | 32 x 12 Hedge | May 1963 |
| 9 | 25 | 10.13 | Tall and dwarf | Between rows 26 within rows tall 26 dwarf 22 | Oct 1966 |
| 10A | 25 | 10.13 | Tall and dwarf | 22 x 22 Square | Nov. 1972 |
| 10B | 25 | 10.13 | Tall and dwarf | 22 x 22 Square | May 1973 |
| 11A | 30 | 12.15 | (i) Tall and dwarf | 22 x 22 Square | Oct 1973 |
| | (0010) | (4.05) | (ii) Tall (part) | 24 x 24 Square | Nov 1985 |
| 11B | 20 | 8.10 | (ii) Tall | 25 Equilateral triangular | Dec 1985/86 |
| 12 | 22 | 8.91 | (ii) Tall | 25 Equilateral triangular | April 1985 |
| 13 | 37 | 14.99 | (ii) Tall | 25 Equilateral triangular | June 1984/85 |
| 14 | 37 | 14.99 | Tall and dwarf | 22 x 22 Square | Nov 1974 |
| Total | 334.5 | 135.4 | | | |

*Figures in parenthesis indicate extent of the part with new (second) planting where only part has a second planting.

(i) First plantation (ii) Second plantation

**Planting distance is given in feet

## Table 16—*Classification of palms, Isolated Seed Garden*

| | TALL | | | | | | | DWARF | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Dwarf green | | | | | | | Dwarf yellow | | | | | | |
| *Field No.* | *B* | *PB* | *YP* | *S* | *D* | *V* | *Total planting points* | *B* | *PB* | *YP* | *S* | *D* | *V* | *Total planting points* | *B* | *PB* | *YP* | *S* | *D* | *V* | *Total planting points* | *Total for field* |
| 1 | 242 | 8 | 57 | 20 | — | 3 | 330 | | | | | | | | | | | | | | | 330 |
| 2 | 251 | — | — | 27 | — | 138 | 416 | | | | | | | | | | | | | | | 416 |
| 3 | 266 | — | 65 | — | — | 10 | 341 | | | | | | | | | | | | | | | 341 |
| 4 | 1904 | — | 176 | — | — | 482 | 2562 | | | | | | | | | | | | | | | 2562 |
| 5 (1) | — | — | — | — | — | — | — | 146 | — | — | — | — | — | 146 | | | | | | | | 146 |
| (2) | — | — | 415 | 2 | — | 3 | 420 | — | — | 215* | 33 | — | 6 | 254 | | | | | | | | 674 |
| 6 | 860 | — | — | — | — | 518 | 1378 | | | | | | | | | | | | | | | 1378 |
| 7 | 672 | — | — | — | — | 745 | 1417 | | | | | | | | | | | | | | | 1417 |
| 8 A | 231 | — | — | — | — | 131 | 362 | | | | | | | | | | | | | | | 362 |
| 8 B | 336 | — | — | — | — | 168 | 504 | | | | | | | | | | | | | | | 504 |
| 8 C | 326 | — | — | — | — | 363 | 689 | | | | | | | | | | | | | | | 689 |
| 9 | 628 | — | — | 174 | — | 9 | 811 | 276 | — | — | 486 | — | 182 | 944 | | | | | | | | 1755 |
| 10 A | 181 | — | — | — | — | 23 | 204 | 98 | — | — | 7 | — | 49 | 154 | 861 | 5 | 59 | 8 | — | 580 | 1513 | 1871 |
| 10 B | 129 | — | — | — | — | 30 | 159 | 304 | — | 7 | 33 | — | 406 | 750 | 316 | — | 36 | — | — | 141 | 493 | 1402 |
| 11 A (1) | 297 | — | 9 | — | 1 | 53 | 360 | 456 | — | — | — | — | 571 | 1027 | 127 | — | 3 | — | 1 | 126 | 257 | 1645 |
| A (2) | — | — | — | 645 | — | — | 645 | | | | | | | | | | | | | | | 644 |
| 11 B (1) | 241 | — | — | — | — | — | 241 | | | | | | | | | | | | | | | 241 |
| (2) | — | — | — | 1335 | — | 186† | 1521 | | | | | | | | | | | | | | | 1521 |
| 12 (1) | 168 | — | — | — | — | — | 168 | | | | | | | | | | | | | | | 168 |
| (2) | — | — | 1396 | 48 | — | — | 1444 | | | | | | | | | | | | | | | 1444 |
| 13 (1) | 210 | — | — | — | — | 76‡ | 286 | | | | | | | | | | | | | | | 286 |
| (2) | — | — | 2380 | 64 | — | — | 2444 | | | | | | | | | | | | | | | 2444 |
| 14 | 305 | — | 6 | — | — | 151 | 462 | 1029 | — | — | — | — | 1617 | 2646 | | | | | | | | 3108 |
| Total | 7247 | 8 | 4504 | 2315 | 1 | 3089 | 17164 | 2309 | — | 222 | 559 | — | 2831 | 5921 | 1304 | 5 | 98 | 8 | 1 | 847 | 2263 | 25348 |

B, bearing palms; PB, partially bearing palms; YP, young palms; S, Seedling; D, duds.

V, Vacancies; †, seedholes not yet planted; ‡, vacancies in guard rows

(1) and (2), first and second plantations

* Some of these would be partially bearing by now but inflorescences are cut away before they open.

**Table 17** *Rainfall intensity and distribution* 1986 *and* 1987 *and* 10 *year average* (1977—1986) *Isolated Seed Garden*

| | 1986 | | | 1987 | | | 10 *year average* 1977—1986 | | |
|---|---|---|---|---|---|---|---|---|---|
| *Month* | *A* | *B* | *C* | *A* | *B* | *C* | *A* | *B* | *C* |
| January | 59.1 | 9 | 9 | 6.3 | 2 | 1 | 24.48 | 3.3 | 3.2 |
| February | 65.8 | 3 | 3 | — | — | — | 50.91 | 3.7 | 3.4 |
| March | 55.3 | 4 | 4 | 21.7 | 4 | 4 | 93.43 | 5.4 | 4.6 |
| April | 104.9 | 12 | 10 | 141.1 | 10 | 10 | 168.24 | 9.3 | 7.9 |
| May | 121.9 | 9 | 8 | 100.2 | 8 | 8 | 208.26 | 11.1 | 8.7 |
| June | 74.5 | 6 | 6 | 49.8 | 7 | 7 | 74.08 | 9.7 | 8.4 |
| July | 4.2 | 3 | 1 | 4.5 | 2 | 1 | 33.67 | 5.6 | 4.6 |
| August | 47.4 | 5 | 5 | 48.1 | 8 | 7 | 33.62 | 4.1 | 3.5 |
| September | 37.4 | 12 | 10 | 270.8 | 12 | 11 | 87.22 | 9.9 | 8.6 |
| October | 200.0 | 17 | 16 | 467.6 | 20 | 20 | 284.61 | 15.6 | 15.0 |
| November | 236.1 | 7 | 7 | 143.2 | 11 | 11 | 286.71 | 15.0 | 13.7 |
| December | 7.6 | 3 | 3 | 49.5 | 4 | 4 | 105.03 | 9.2 | 8.6 |
| Total | 1014.2 | 90 | 82 | 1308.8 | 88 | 84 | 1450.26 | 102.0 | 90.2 |

A, rainfall intensity in mm; B, number of rainy days;
C, Number of wet days (> 1 mm); —, zero rainfall

**Table 18** *Total crop figures for* 1986 *and* 1987 *and* 10-*year average for* 1977—1986 *Isolated Seed Garden*

| *Pick* | 1986 | 1987 | 10-*year average* 1977—1986 |
|---|---|---|---|
| 1 | 130 420 | 121 386 | 91545.9 |
| 2 | 126 262 | 161 534 | 134783.5 |
| 3 | 152 956 | 167 090 | 150221.1 |
| 4 | 162 710 | 101 739 | 138743.9 |
| 5 | 153 294 | 108 538 | 124503.5 |
| 6 | 121 607 | 100 655 | 92671.7 |
| Total | 847 249 | 760 942 | 732469.6 |
| No. of bearing palms | 11 121 | 10 875 | |
| Average no. of nuts per palm | 76 | 70 | |

**Table 19**—*Total numbers of nuts harvested from tall and dwarf palms in 1986 and 1987, together with 5-year average (1982—1986)*

(i) **Tall**

| *Pick* | *1986* | *1987* | *5-year average (1982—1986)* |
|---|---|---|---|
| 1 | 100 501 | 92 297 | 75900.0 |
| 2 | 102 581 | 113 891 | 118100.8 |
| 3 | 135 677 | 127 701 | 145531.4 |
| 4 | 150 377 | 73 866 | 153490.2 |
| 5 | 128 435 | 87 610 | 126966.4 |
| 6 | 100 681 | 84 795 | 81785.6 |
| *Total* | 718 252 | 580 160 | 701775.0 |
| No. of palms in bearing | 7 279 | 7 256 | |
| Nuts/palm | 99 | 80 | |

(ii) **Dwarf**

| *Pick* | *1986* | *1987* | *5-year average (1982—1986)* |
|---|---|---|---|
| 1 | 29 919 | 29 089 | 39914.6 |
| 2 | 23 681 | 47 643 | 54072.4 |
| 3 | 17 279 | 39 389 | 51736.2 |
| 4 | 12 333 | 27 873 | 41860.6 |
| 5 | 24 859 | 20 928 | 45430.4 |
| 6 | 20 926 | 15 860 | 36021.0 |
| *Total* | 128 997 | 180 782 | 269035.2 |
| No. of palms in bearing | 3 842 | 3 619 | |
| Nuts/palm | 34 | 50 | |

Separate crop figures from tall and dwarf palms are given in Table 19 and confirm the observation made last year that the two varieties are very different in their response to changes in weather. While the tall crop has decreased by 19% the dwarf crop has actualy increased by as much as 40% even though the number of dwarf palms in bearing is 223 less than it was last year. The mean numbers of nuts per palms for tall and dwarf were 80 and 50 respectively, for 1987.

The increase in crop from 1986 to 1987 is evident both *green* and *yellow* colour forms of dwarf, but the magnitude of the increase is different , being as much as 63% for the former and only 11% for the latter. The general cropping pattern over the year was much the same for both forms and the number of nuts per palm were 49 and 50 for *dwarf yellow* and *dwarf green* respectively. (Table 20)

**Table 20**—*Pick-wise cropping patterns for dwarf green and dwarf yellow palms in* 1986 *and* 1987, *Isolated Seed Garden*

| | *Dwarf green* | | *Dwarf yellow* | |
|---|---|---|---|---|
| *Pick* | 1986 | 1987 | 1986 | 1987 |
| 1 | 11 724 | 21 042 | 18 195 | 8 047 |
| 2 | 9 381 | 32 986 | 14 300 | 14 657 |
| 3 | 8 533 | 27 104 | 8 746 | 12 285 |
| 4 | 5 879 | 14 427 | 6 454 | 13 446 |
| 5 | 19 856 | 12 404 | 5 003 | 8 524 |
| 6 | 16 101 | 8 752 | 4 825 | 7 108 |
| *Total* | 71 474 | 116 715 | 57 523 | 64 067 |
| No. of palms in bearing | 2 517 | 2 313 | 1 325 | 1 310 |
| Nuts/palm | 28 | 50 | 43 | 49 |

**4.4 Seednut production** A total of 450 248 *typica* seednuts were produced during the year comprising 447 615 *Ambakelle tall and* 2633 *Ambakelle special* with selection percentages of 84.6 and 93.7 respectively. Details of crop-wise selection of *typica* seednuts are given in Table 21. Availability of *dwarf* x *tall* was much higher than demand; consequently, these were used for seednut production only as and when needed. A total of 50 002 *dwarf green* x *tall* and 23 276 *dwarf yellow* x *tall* nuts were utilised as seednuts during the year.

**Table 21**—*Crop-wise selection of typica seednuts during 1987 (excluding nuts from controlled pollinations), Isolated Seed Garden*

| *Pick No.* | *Harvested* | *Heaped* | *Selected* | *Percent of heap selected* |
|---|---|---|---|---|
| 1 | 92 297 | 85 363 | 68 623 | 80.39 |
| 2 | 113 891 | 107 208 | 87 013 | 81.16 |
| 3 | 127 701 | 118 928 | 99 802 | 83.92 |
| 4 | 73 866 | 65 700 | 58 591 | 89.18 |
| 5 | 87 610 | 78 369 | 70 875 | 90.44 |
| 6 | 84 795 | 76 369 | 65 344 | 85.56 |
| *Total* | 580 160 | 531 937 | 450 248 | 84.6 |

**Table 22**—*Emasculation of dwarf palms for the production of nana × typica (CRIC 65) hybrid seednuts, Isolated Seed Garden*

| Field No. | No. of palms emasculated | | No. of inflorescences emasculated | | No. of buttons at emasculation | |
|---|---|---|---|---|---|---|
| | DG | DY | DG | DY | DG | DY |
| 05 | 134 | — | 1 836 | — | 26 949 | — |
| 09 | 254 | — | 1 937 | — | 32 159 | — |
| 10A | 95 | 833 | 944 | 7 469 | 13 078 | 105 929 |
| 10B | 321 | 314 | 3 287 | 2 843 | 65 984 | 42 113 |
| 11A | 507 | 128 | 4 899 | 1 189 | 54 232 | 14 842 |
| 14 | 1 072 | — | 10 653 | — | 133 036 | — |
| *Total* | 2 283 | 1 275 | 23 556 | 11 501 | 325 438 | 162 884 |

DG, dwarf green ; DY dwarf yellow

**4.5 Emasculation of dwarf palms for the production of CRIC 65 hybrid nuts.** Details of emasculation are given in Table 22. A total of 3 658 dwarf palms comprising 2 383 of the *green* and 1 275 of the *yellow* form were emasculated during the year. The number of emasculated inflorescences was 35 057 and they had 488 322 buttons at emasculation. The crop from dwarf palms is likely to be exceptionally low next year. Nine hundred and forty two immature inflorescences were destroyed due to infestation by ants or premature splitting of spathes.

**4.6 Controlled pollinations** The crossing programme planned for research purposes was discontinued due to the urgent need of seednuts for planting the proposed super seed garden. Pollinations carried out were only for the production of "*Ambakelle special*' tall material and selfed *dwarf green* and *dwarf yellow* for filling vacancies in the seedgarden. Only tall pollen from selected tall palms were processed during the year.

**4.7 Crop disposal** Crop disposal figures are given in Table 23. Conversion to copra of surplus nuts was discontinued and they were handed over to the Estates Division without charge. Tall nuts not suitable for use as seednuts were sold on contract.

**Table 23**—*Crop disposal as at 31st December 1987, Isolated Seed Garden*

| | *Method of disposal* | *No. of nuts from* | | | *Total* | *Percent of total production* |
|---|---|---|---|---|---|---|
| | | *Tall* | *DG* | *DY palms* | | |
| 1. | Delivered as seednuts | 423 358 | 46 060 | 21 263 | 490 681 | 64.48 |
| 2. | Husked and split nuts* | 43 779 | 15 713 | 24 554 | 84 046 | 11.04 |
| 3. | For research purposes : | | | | | 0.28 |
| | GPB Division | 996 | 120 | 120 | 1 236 | 0.16 |
| | Other Divisions | 934 | — | — | 934 | 0.12 |
| 4. | Nut allowance to staff | 16 114 | — | — | 16 114 | 2.12 |
| 5. | Sold on contract (crops 1, 2, and 4) | 24 426 | — | — | 24 426 | 3.21 |
| 6. | Sent PRS for copra conversion | — | 37 791 | 10 262 | 48 053 | 6.32 |
| 7. | Others† | 13 | 21 | 25 | 59 | 0.01 |
| 8. | Rejections (not suitable for curing) | 11 287 | 11 383 | 4 774 | 27 444 | 3.61 |
| 9. | To be disposed** (crops 3, 5 and 6) | 59 253 | 5 627 | 3 069 | 67 949 | 8.93 |
| | Total crop : | 580 160 | 116 715 | 64 067 | 760 942 | 100 |

*Converted to copra after recording for research purposes

†Issued to exhibitions etc.

**Includes seednuts awaiting delivery and nuts to be sold

GPB, Genetics of Plant Breeding; PRS, Pothukulama Research Station.

## 4.8 Field operations and maintenance

**4.8.1 Manuring** Fertilizer application during the year was started with field no. 5, where the second split dose at the rate of 700 g YPM per young palm,scheduled for the end of 1986, had not been completed due to lack of rains in December. This was carried out in January.

All palms in fields 11A, 11B, 12, 13 and 14 were fertilized during the May/June season.

The fertilizer programme scheduled for the Maha season was interrupted due to exceptionally heavy showers in October followed by less rain than expected in December. Consequently, the entire programme as planned could not be accomplished and application of the second split dose of YPM to the replanted areas had to be postponed to 1988. However, it was possible to complete fertilizer application to the adult palms on fields 1-5 and 8,9, 10A and 10B.

All adult palms were given 3 kg of Adult Palm Mixture (APM) in a single dose per year while young palms and seedlings were given 1,200 and 900 g respectively, in split doses.

As a measure to improve the condition of fields 6 and 7 which have been giving the lowest yields, the inorganic fertilizer was supplemented with goat dung and applied in circular trenches, 0.92 m (3 ft.) wide and 0.16 m (2 ft.) deep, at a distance of 0.16 m (2 ft. ) away from the base of the palm.

**4.8.2 Mulching and collection of fallen fronds** All palms and seedlings were mulched immediately after manuring. Adult palms were mulched with fallen fronds and these were replenished with the onset of the dry season. Husks were used for mulching young palms and seedlings, the mulching circle being extended upto 1.2 m (4 ft.) to restrict growth of illuk and other weeds within the manure circle. Consequently, the young palms did not show advese effects of the dry conditions that prevailed during the year.

**4.8.3 Weeding** Weed control continued to be a problem, particularly during the rainy season. Priority was given to control of weeds in the replanted areas, where regular rotaslashing was carried out in an attempt to prevent flowering and seed dispersal of *Imperata cylindrica* (illuk) in these areas. However, frequent slashing appeared to enhance flowering of this weed, requiring frequent rotaslashing.

In certain areas *Brachiaria milliiformis* was found to replace illuk, especially after a few showers. The growth of *Pennisetum polystachyon* (mana) was not as widespread as in previous years.

The use of harrow and nine-tyne tiller for control of weeds was restricted due to the long dry spells encountered this year. Rather, rotaslashing and manual weeding were carried out so that disturrbance of the soil was reduced to a minimum.

**4.8.4 Cover Crops** A concerted effort was made to establish covercrops in the replanted areas of fields 11A and 11B and in fields 14 and 9. Cover crop seed was sown in alternate rows after land preparation by use of harrow followed by nine-tyne tiller to collect and remove weed trash including subterranean parts. This nine-tyne tiller was also used lightly after sowing to embed the seeds in the soil.

Three different methods for establishment of covers were tried out (*a*) germination of seeds in polythene bags prior to placement in the field (b) sowing direct after land preparation (*c*) planting in rows 0.46 - 0.61 m (1½-2 ft.) apart. Planting in rows was found to be the most satisfactory method for the establishment of covers as fertilizer application and control of weeds could be carried out more effectively.

Vacant areas in field 11A were sown with *Crotolaria juncea* after land preparation.

Most of the seed used for sowing was collected from ISG. The following quantities (kg) were planted as follows :

| Field | 11A | 11B | 14 | 9 | 1 |
|---|---|---|---|---|---|
| *Pueraria phaseoloides* ... | 9.5 | 22.35 | — | — | 0.45 |
| *Calapogonium muconoides* ... | 10.0 | 10.70 | — | 7.0 | — |
| Centrosema pubescens ... | — | 2.00 | — | — | — |
| Crotolaria juncea ... | 16.5 | — | 20.0 | — | — |

**4.8.5 Husk burying** The programme of establishment of huskpits of dimension 1.25 x 1.25 x 0.9 m (4 x 4 x 3 ft.), one for each palm, on field no. 9, begun last year was continued but could not be completed as unexpected heavy rains restricted progress. A total of 937 pits were completed.

**4.8.6 Drains** Drains were weeded and kept clean but deepening and desilting were not required due to the dry conditions which prevailed over most of the year. A total of 2,379 m (1296.5 fathoms) of contour drains on fields 6,7 and 10B and 7,645 m (4166.5 fathoms) drainage drains on fields 1, 4, 5, 8, 11A, 11B, 12 and 13 were maintained during the year.

**4.8.7 Pests** Regular inspections for pests were carried out, with particular attention directed at the dwarf palms and young plantations. The instances of black bettle attack in the young plantations were negligible. There was increased red weevil attack in the dwarf palms due to the damage to fronds caused by climbers during emasculation. These palms were treated with Metasystox and Monocrotophos and those that succumbed were uprooted, transported out of the field and burnt.

**4.8.8 Uprooting of palms** A total of 216 palms comprising 38 tall, 162 dwarf *green* and 16 *dwarf yellow* were uprooted, their distribution being as follows:

| | Field no. | 1 | 3 | 4 | 6 | 7 | 8 | 9 | 10A | 10B | 11A | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Tall | 1 | 3 | 3 | 5 | 22 | 2 | 2 | — | — | — | — |
| of | DG | — | — | — | — | — | — | 12 | 4 | 19 | 65 | 62 |
| palms | DY | 1 | — | — | — | — | — | — | 7 | 4 | 5 | — |
| | *Total* | 1 | 3 | 3 | 5 | 22 | 2 | 14 | 11 | 23 | 70 | 62 |

Over half the young palms uprooted, comprising 145 *dwarf green* and 11 *dwarf yellow*, had been damaged by red weevil. Thirteen *dwarf green* and 5 *dwarf yellow* seedlings were affected by drought while the other causes for uprooting were lightning. wind damage and general weakness.

**4.8.9 Replanting** Planting of the remaining portion of 11B, begun last year was delayed, first because of insufficient rain and then due to water logging after unprecedented showers in October. A total of 614 Ambakelle special seedlings, some of which were polybagged were planted towards the end of the year. A further 186 holes remain to be planted.

**4.8.10 Filling of vacancies** Infilling in the young plantations was carried out as follows: 113, 33, 48 and 64 tall vacancies in fields 11A, 11B, 12 and 13 respectively and 55 tall and 166 dwarf vacancies in field no. 9, amounting to a total of 313 tall and 166 dwarf vacancies. Although all vacancies in field 9 were filled last year there were a further 160 *dwarf green* casualties which remain to be filled.

**4.8.11 Fences** The fence bordering the Welipelessa area 1121.1 m (611 fathoms), was reparied completely using about 483 kg new barbed wire.

**4.8.12 Roads, paths and buildings** All boundry roads were cleared and maintained satisfactorily. A new road was opened within the barrier from Attangane gate toward Welipelessa to enable effective supervision by vehicle when required.

A temporary cycle shed was constructed. Although construction work on a Grade III bungalow was started, this was discontinued due to complications with the contractor.

The office building and circuit bungalow were repainted.

**4.8.13 Electricity and water supply** A new generator was installed during the latter part of the year. Work on construction of the central water tower was abandoned. Domestic requirements of water were met by transporting water by bowser from wells and pumping to the overhead tanks of the residential quarters.

**4.8.14 Vehicles, machinery and tooes** New vehicles and machinery received were as follows : an additional rotaslasher, Ford tractor 37/6169 trailer, bowser (46/2220) with pump attachment, Honda motor cycle 94/8913 and two new push bicycles CWE 11300 and CWE 11471, one of which was a replacement for the one lost last year. The jeep 31/5093 was repaired.

The four tractors, nos. 36/2642, 36/2643, 36/988 and 37/90 were maintained satisfactorily and two of them (36/2642 and 36/988) were overhauled during the year.

**4.8.15 Tanks and irrigation project** The renovation of this project, begun last year was completed but frequent break down of the pump engines limited the use of the system for irrigation of the plantation. Wild animals continued to damage some of the PVC riserpipes at points near the jungle barrier.

All replanted areas were irrigated by means of bowser to minimise adverse effects of the dry conditions which prevailed.

**4.8.16 Cattle** The stud bull, remaining after transfer of the rest of the herd to Bandirippuwa Estate died.

**4.8.17 Jungle barrier** Illicit felling of timber is now infrequent. One detection was made and action taken.

**4.8.18 Watchers** The main gate was manned day and night by two watchers working 12 hour shifts. An additional temporary watcher from the checkroll was enlisted to check wild boar attack in young palms in the new plantations.

All other gates were kept locked and opened only when the need arose. Gates were installed at the Welipelessa and Attangane new road. These were kept locked and opened only to permit entry of workers during working hours.

**Table 24**—*Seednuts supplied for each season*

| *Year & quarter* | *Planting season* | *CCB nurseries* | | | | *CRB nurseries* | | | | *Others* | | | | *GRAND TOTAL* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *PP* | *T × T* | *D × T* | *Total* | *PP* | *T × T* | *D × T* | *Total* | *PP* | *T × T* | *D × T* | *Total* | |
| 1986/4 | Maha 87/88 | 99 450 | 73 735 | 4 500 | 177 685 | 1 450 | 10 000 | — | 11 450 | — | 2 750 | — | 2 750 | 191 885 |
| 1987/1 | Maha 87/88 | 509 930 | 77 727 | 16 278 | 603 935 | 241 | 896** 2 000 | — | 3 137 | — | 2 000 | 15 525* | 17525 | 624 597 |
| 1987/2 | Maha 87/88 | 154 600 | 164 370 | 14 000 | 332 970 | — | 5 500 633** | — | 6 138 | — | — | 6 500* | 6 500 | 345 603 |
| Total | MAHA 87/88 | 763 980 | 315 832 | 34 778 | 1 114 590 | 1 691 | 19 029 | — | 20 720 | — | 4 750 | 22 025 | 26 775 | 1 162 085 |
| 1987/3 | Yala 88 | 369 145 | 125 000 | 14 500 | 508 645 | — | 470** 5 000 | 240** | 5 710 | — | — | — | — | 514 355 |
| 1987/4 | Yala 88 | 92 165 | 6 229 | 11 500 | 109 894 | — | — | — | — | — | — | — | — | 109 894 |
| Total | YALA 88 | 461 310 | 131 229 | 26 000 | 618 539 | — | 5 470 | 240 | 5 710 | — | — | — | — | 624 249 |
| 1987/4 | Maha 88/89 | 109 045 | 33 770 | — | 142 815 | 540 | 350** 3 000 | — | 3 890 | — | — | — | — | 146 705 |
| Total supplied during 1987 | | 1 234 885 | 407 096 | 56 278 | 1 698 259 | 781 | 17 849 | 240 | 18 870 | — | 2 000 | 22 025 | 24 025 | 1 741 154 |

*PP, plus palm seednusts; T × T, CRIC* 60; *D × T, CRIC* 65

*, for export, JEDB and the general public; **, for research purposes

**4.3.19 Research nursery** A detailed report is given in section 7 entitled Research Nursery.

*D. M. Pathirage*

## 5. SEED PRODUCTION

**Table 24**

**5.1 Seednut supply** Details of the seednut supply for the three seasons, Maha 1987/88, Yala 1988 and Maha 1988/89 are given in Table 24. A total of 1,741 154 seednuts comprising 1,235 666 plus palms seednuts, 426 945 *CRIC* 60 (*T* X *T*) and 78 543 *CRIC* 65 (*D* X *T*) seednuts were supplied during the year. Thus, about 29% of the seednuts supplied were from ISG.

The seednut requirement of the Coconut Cultivation Board (CCB) was again less than 2 million and hence met without difficulty. However, the improved material from ISG made up only 27.3% supplied to CCB. This was due to the sudden decrease in crops at ISG mid-year which continued upto the end of the year. Crops on other estates also declined but this did not immediately affect supply seriously as there were more palms than needed in the pool and nuts were taken from the different estates in rotation. However' the downward trend in crops is likely to continue and it is imperative that all suppliers are retained. Even so, a severe shortfall is likely in 1988.

A total of 1,450 dwarf seednuts comprising 500 each of *dwarf red* and *dwarf yellow* and 450 *dwarf green* were also supplied to the Coconut Cultivation Board during the year.

**5.2 Plus palms** Due to the low demand for seednuts, and the fairly satisfactory yields in the first half of the year, the entire plus palms pool was not utilized for seednut supply. The available plus palms pool, excluding NLDB Melsiripura Farm which continues to have problems with pickers, stands at just over 50,000 palms on 24 estates in the three districts of Kurunegala, Puttalam and Gampaha in the coconut triangle.

The plus palms selected in 1982/83 were due for re-selection but this was postponed due to unsuitable conditions. A new method for selecting source material for seednuts was proposed and approval obtained. It was expected to begin this selection in 1988. Details of the method are given elsewhere in this report, under section 3, Miscellaneous experiments (item 3.6)

**5.3 Seednut Selection** Seednut production at ISG, Ambakelle amounted to a total of 523 526 comprising 450 248 *tall* and 73 278 *dwarf* X *tall* hybrids. Selection percentages were generally maintained at 80-90%. Details are given in section 4.4 and Table 21.

In order to utilise nuts from all six crops at ISG for seednut purposes, slight adjustments were made to the times of delivery of seednuts to nurseries, with seednuts issued from December to June for the Maha season and from July to October for Yala.

Based on recent research findings summarised elsewhere in this report, under Project 6, Experiment 6.4, it was decided that all nuts harvested from plus palms and palms in seed gardens should be used as seednuts without any further seednut selection. This will come into operation from January 1988.

*P. Kariyawasam*

## 6. POLLEN and POLLINATION

**6.1 Pollen collection and issue** Details of pollen collection and issue are given in Table 25.

**Table—25** *Pollen collection and issue*

| | No. of Ampoules | | | | | |
|---|---|---|---|---|---|---|
| | | *typica* | | | *nana* | |
| | *ISG palms* | *Variety palms (BE)* | *San Ramon (BE)* | *YD (ISG* | *GD (ISG)* | *BGD (BE)* |
| *Carried over from* 1986 : | | | | | | |
| Pollen from individual palms | 452 | — | 91 | 140 | 203 | — |
| Mixed pollen adulterated with lycopodium | 57 | — | — | — | — | — |
| *Sealed in 1987:* | | | | | | |
| Pollen from individual palms | 736 | 39 | 32 | — | — | 15 |
| Mixed pollen adulterated with lycopodium | 216 | — | — | — | 48 | — |
| *Issued to estates (at Rs. 10/- per ampoule)* : | | | | | | |
| Mixed pollen adulterated with lycopodium | 265 | — | — | — | — | — |
| *Issued for pollination programmes* : | | | | | | |
| Pollen from individual palms | | | | | | |
| (1) at ISG | 488 | — | — | — | — | — |
| (2) at B/E | — | 16 | 24 | — | — | 8 |
| Mixed pollen adulterated with lycopodium | | | | | | |
| (1) at ISG | — | — | — | — | 17 | — |
| (2) at B/E | — | — | — | — | — | — |
| *Other Uses* (Viability tests, demonstrations, breakages etc. | | | | | | |
| Pollen from individual palms | 60 | — | 20 | 30 | 40 | — |
| *Special Use** (No Viability/ low viability) | | | | | | |
| Pollen from individual palms | 126 | — | 41 | 110 | 132 | — |
| *Balance as at 31.12.86* | | | | | | |
| Pollen from individual palms | 451 | 23 | 38 | — | — | 7 |
| Mixed pollen adulterated with lycopodium | 8 | — | — | — | 31 | — |

*YD, Yellow dwarf; GD, green dwarf; BGD, Brazilian green dwarf*

*This pollen was found to have lost viability. It was inactivated and used for checking of pollination programme.

Pollen of the *typica* variety was collected during the year from 15 inflorescences from 15 selected palms on fields 1 and 2 of the Isolated Seed Garden and from 8 inflorescences from seven of the 36 selected palms on field no. 9 at ISG. A total of 736 ampoules of unadulterated pollen was sealed. Pollen from palms on fields 1 and 2 were mixed together, adulterated with lycopodium and resealed; a total of 216 such ampoules were produced during the year.

Pollen from local forms of *typica* on the Variety Block (field no. 9) at Bandirippuwa estate, namely *kamandala, bodiri, ran thembili, navasi and gon thembili,* was collected from 15 inflorescences from 9 palms. Thirty nine ampoules of pollen were sealed.

*San Ramon* pollen was collected from three inflorescences from selected palms on field no. 16 and field no. 9 (Variety Block) at Bandirippuwa. A total of 32 ampoules was sealed.

Thirty one ampoules of unadulterated pollen of *nana pumila,* collected last year from young palms on the new plantation on field no. 5, ISG, were mixed, adulterated with lycopodium and resealed to give 48 ampoules.

Pollen of *Brazilian Green Dwarf* was collected from palms raised from nuts introduced from the Ivory Coast and now growing in the old nursery site at Bandirippuwa Estate. Collection was from two inflorescences from two palms. Fifteen ampoules of this unadulterated pollen were sealed for use in the pollination programme.

Pollen from the variety *spicata* was processed from two inflorescences brought from germplasm collection in the Southern Province and issued to ISG for use in hybrid production, on a trial basis.

Four ampoules of pollen were processed from a tall palm at Bandirippuwa and exported to Bahrain.

A total of 265 ampoules of *typica* pollen were issued to Pitiyakande, Daisy Valley and Palugaswewa Estate of the JEDB at Rs. 10/- per ampoule. There were no applications for pollen from private estates.

A total of 409 ampoules of pollen of the forms *typica, San Ramon, nana pumila* and *nana eburnea* sealed in 1986 were found to have lost viability. These sealed ampoules were immersed for 30 minutes in water brought upto boiling point to ensure inactivity and then used as checks in the pollination programme.

*W. B. S. Fernando*

## 7. RESEARCH NURSERY

**7.1 Ambakelle nursery** Research acitivities at Ambakelle nursery were reduced to a minimum and laying was limited to 1,953 *Ambakelle special* nuts to meet requirements of the seed garden only. The bulk of nuts resulting from the pollination programmes was removed to the Research Nursery at Bandirippuwa.

Details of seedlings issued are given in Table 26 and availability of planting material as at 31 December in Table 27.

**Table 26**—*Seedling issues from Ambakelle nursery*

| *Variety* | *ISG* | *GPB* | *Other divisions* | *Commercial issues* | *Total* |
|---|---|---|---|---|---|
| Ambakelle special | 557 | 123 | 363 | | 1 043 |
| Ambakelle Tall | | | | 80 | 80 |
| Tall* | 95 | 90 | 244 | | 429 |
| DG × tall | | | 1 | 2 | 3 |
| DY × tall (CRIC 65) | | | 1 | 2 | 3 |
| Plus palm tall | | | 1 | 292 | 293 |
| *From pollination programme* | | | | | |
| Ambakelle super | | 290 | | | 290 |
| Tall × DG | | 283 | 14* | | 297 |
| Tall × SR | | 441 | 18* | | 459 |
| SR × SR | | 36 | | | 36 |
| DG × tall | | 90 | 12* | | 102 |
| DG × SR | | 181 | 15* | | 26 |
| DG × DG | | 26 | | | 26 |
| DG (Selfed ISG) | | 166 | 1 | | 167 |
| DG (selfed RE) | | | 23 | | 23 |
| DY (selfed RE) | | | 4 | | 4 |
| DY (selfed ISG) | | 12 | | | 12 |
| DR (selfed RE) | | | 23 | 5 | 28 |
| DR (selfed BE) | | 15 | | | 15 |
| Bodiri | | 2 | | | 2 |
| Navasi | | 2 | | | 2 |
| Ranthembili | | 2 | | | 2 |
| Kamandala | | 5 | | | 5 |
| King coconut | | 1 | | | 1 |
| Rathran thembili | | 4 | | | 4 |
| Total | 652 | 1 769 | 800 | 301 | 3 522 |

*DG, dwarf green; DY, dwarf yellow; DR, dwarf red; SR, San Ramon.*

Tall*, from abandoned pollinations in which tall was seed palm. Tall pollen was used on those issued to ISG

ISG, RE or BE in parenthesis indicates seed palm is at the isolated seed garden, Ratmalagara or Bandirippuwa estate, respectively.

*, issued for replacing casualties in observation block at Bandirippuwa Estate

**Table—27** *Availability of planting material at Ambakelle, nursery as at 31 December 1987*

| *Variety* | *Seedling over 5 months from laying* | | *Total* |
|---|---|---|---|
| | *in beds* | *in polybags* | |
| Ambakelle special | 58 | — | 58 |
| *From controlled pollinations* : | | | |
| Ambakelle super | 93 | 126 | 219 |
| Tall × dwarf green | 9 | 111 | 120 |
| Tall × Saan Raman | 39 | 110 | 149 |
| Dwarf green × tall | 67 | — | 67 |
| Dwarf green × San Ramon | 26 | — | 26 |
| *Total* | 292 | 347 | 639 |

**Table 28** *Seednuts laid at Bandirippuwa research nursery*

| *Variety* | *Source* | *Number of seednuts* |
|---|---|---|
| **(i) From pollination programme** | | |
| Ambakelle super | ISG | 972 |
| Tall × DG | ISG | 687 |
| Tall × DY | ISG | 704 |
| Tall × SR | ISG | 942 |
| Tall[a] | ISG | 571 |
| DG × tall | ISG | 217 |
| DG × DG | ISG | 136 |
| DG × DY | ISG | 119 |
| DG × SR | ISG | 172 |
| DY × tall | ISG | 237 |
| DY × DG | ISG | 122 |
| DY × DY | ISG | 124 |
| DY × SR | ISG | 167 |
| DG selfed | ISG | 487 |
| DG selfed | RE | 306 |
| DY selfed | ISG | 127 |
| DY selfed | RE | 274 |
| DR selfed | RE | 577 |
| SR × SR | BE field no. 16 | 192 |
| *Total* | | 7 133 |

| | | | |
|---|---|---|---|
| **(ii)** | **For replacement of casuaties in trials** | | |
| | Ambakelle special | ISG | 647 |
| | Plus palm tall | Various estates | 300 |
| | Moorock tall | Moorock estate | 500 |
| | *Total* | | 1 447 |
| **(iii)** | **For germplasm collections** | | |
| | Bodiri | | 2 |
| | Porapol | | 19 |
| | Nawasi | | 14 |
| | DY | | 3 |
| | Spicata | | 19 |
| | Tall OP | Moorock | 240 |
| | Tall OP | Pitiyakande | 302 |
| | Tall OP | Wellawa | 242 |
| | Ambakelle tall | Ambakelle (ISG) | 270 |
| | SR | Clovis | 408 |
| | New form | Koggala | 6 |
| | Total | | 1 525 |
| **(iv)** | **For commercial issue** | | |
| | Ambakelle tall | ISG | 520 |
| | DG × tall | ISG | 120 |
| | DY × tall | ISG | 120 |
| | *Total* | | 760 |
| | GRAND TOTAL | | 10 865 |

*DG, dwarf green; DY, dwarf yellow; SR, San Ramon*

Tall*, abandoned pollinations in the which tall was seed palm

Tall OP, open-pollinated nuts harvested from tall palms

ISG, Isolated Seed Garden at Ambakelle; RE, Ratmalagara Estate; BE, Bandirippuwa Estate.

**7.2 Bandirippuwa research nursery** The new research nursery at Bandirippuwa is now well established but lack of irrigation facilities presented a serious problem in the dry season. There was also a shortage of labour butthis was overcome towards the end of the year by recruitment of a few additional labourers.

A total of 10,864 seednuts was laid during the year, details of which are given in Table 28. The percent germination varied widely both with variety and with month of laying. Seedling issues are given in Table 29 and availability of planting material as at 31 December in Table 30. The details of seedlings issues to the Division of Genetics & Plant Breeding are listed in Table. 31.

*W. G. A. Ratnasiri, W. M. U. Fernando, M. H. L. Padmasiri and M. A. S. Fernando*

**Table 29**—*Seedling issues from Bandirippuwa research nursery*

| *Variety* | *ISG* | *from* | *GPB in polybags* | *Other divisions* | *Other purposes** | *Commercial issues* | *Total* |
|---|---|---|---|---|---|---|---|
| Ambakelle special | 277 | 42 | — | — | — | — | 319 |
| Ambakelle Tall | — | 100 | 7 | 25 | 202 | 274 | 608 |
| DG X tall | — | 7 | 6 | 12 | — | 123 | 148 |
| DY X tall | — | 7 | 9 | 17 | 1 | 68 | 102 |
| DG X DG | — | 12 | — | — | — | — | 12 |
| DY X DY | — | 17 | — | — | — | — | 17 |
| Tall X SR | — | 8 | — | — | — | — | 8 |
| San Ramon | — | — | 43 | — | — | — | 43 |
| Plus palm tall | — | — | 5 | — | — | 116 | 121 |
| Moorock tall | — | - | 4 | — | — | 217 | 221 |
| Total | 277 | 193 | 74 | 54 | 203 | 798 | 1 599 |

*, Free issues, for exhibitions etc.

**Table 30**—*Availability of planting material at Bandirippuwa research nursery as at 31 December 1987*

| *Variety* | *Seedling over 5 months from laying* | | *Total* |
|---|---|---|---|
| | *in beds* | *in polybags* | |
| **(i) From controlled pollinations :** | | | |
| Ambakelle super | — | 390 | 390 |
| Tall × DG | — | 191 | 191 |
| Tall × DY | — | 165 | 165 |
| Tall × SR | — | 408 | 408 |
| Tall* | — | 237 | 237 |
| DG × tall | — | 59 | 59 |
| DG × DG | — | 21 | 21 |
| DG × DY | — | 1 | 1 |
| DG × SR | — | 51 | 51 |
| DY × tall | — | 19 | 19 |
| DY × DG | — | 16 | 16 |
| DY × DY | — | 5 | 5 |
| DY × SR | — | 11 | 11 |
| DG selfed | — | 18 | 18 |
| DY selfed | — | 6 | 6 |
| DR selfed | — | 21 | 21 |
| SR × SR | 53 | | 53 |
| **(ii) For germplasm collections** | | | |
| Tall (Moorock) | 148 | — | 148 |
| Tall (Pitiyakande) | 91 | — | 91 |
| Tall (Wellawa) | 111 | — | 111 |
| **(iii) From directed natual pollination** | | | |
| Ambakelle special | 13 | — | 13 |
| Ambakelle tall | — | 18 | 18 |
| DG × tall | — | 19 | 19 |
| DY × tall | — | 16 | 16 |
| **(iv) Open pollinated nuts** | | | |
| Plus palm tall | — | 20 | 20 |
| Moorock tall | — | 21 | 21 |
| *Total* | 416 | 1 713 | 2 129 |

*DG, dwarf green; DY, dwarf yellow; SR, San Ramon;*
Tall*, abandoned pollinations in which tall was seed palm

**Table 31**—*Seedling issues from*

*(A) Ambakelle nursery, (B) Bandirippuwa research nursery to Genetics & Plant Breeding Division for planting of trials.*

| *Variety* | | *Location + of trial* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *BE* | *D* | *T* | *P* | *S* | *R* | *A* | M | *DV* |
| (i) *From pollination programme* | | | | | | | | | | |
| Ambakelle super | A | 5 | | | | | | 98 | 97 | 90 |
| Tall × DG | A | 3 | | | | | | 91 | 99 | 90 |
| Tall × SR | A | 5 | | | | | 1 | 93 | 162 | 180 |
| | B | | | | | | | 1 | | 7 |
| Tall* | A | | | | | | | | 90 | |
| | B | | | | | | | 1 | | |
| DG × Tall | A | | | | | | | | | 90 |
| DG × SR | A | | | | | | | 91 | | 90 |
| DG × DG | A | 26 | | | | | | | | |
| | B | 12 | | | | | | | | |
| SR × SR | A | 4 | | | | | | 32 | | |
| | B | | | | | | | 43 | | |
| DY selfed | A | 12 | | | | | | | | |
| | B | 17 | | | | | | | | |
| DR selfed | A | 15 | | | | | | | | |
| Bodiri | A | 2 | | | | | | | | |
| Nawasi | A | 2 | | | | | | | | |
| Ran Thembili | A | 2 | | | | | | | | |
| Kamandala | A | 5 | | | | | | | | |
| King coconut | A | 1 | | | | | | | | |
| Rathran thembili | A | 4 | | | | | | | | |
| (ii) *Others* | | | | | | | | | | |
| Ambakelle special | A | 12 | | | | | 3 | 9 | 99 | |
| | B | 37 | | | 4 | | | 1 | | |
| Ambakelle tall | B | 2 | 2 | | 2 | 1 | | 100 | | |
| DG × tall | B | 8 | | 1 | 3 | 1 | | | | |
| DY × tall | B | 7 | | 4 | 5 | | | | | |
| Plus palm tall | B | 1 | | | 4 | | | | | |
| Moorock tall | B | 1 | | 2 | 1 | | | | | |
| *Total* | A | 98 | | | | | 4 | 405 | 448 | 540 |
| | B | 75 | 2 | 7 | 19 | 2 | | 45 | | 7 |

+ BE, Bandirippuwa Estate for Evaluation of cultivars, Progeny trial, Crop museum and Germplasm collections

D, Dambakande, T, Thammenna, P, Palugaswewa, S, Suriyapura, for evaluation of cultivar trials

R, Ratmalagara, A, Andigama, M. Mangala Eliya, DV, Daisy Valley, for Progeny trials

Talls*. from abandoned pollinations in which tall was seed palm

## 8 EXTENSION ACTIVITIES

The Isolated Seed Garden at Ambakelle was the venue for several Board Meetings namely those of the Directors of the Coconut Development Board, the members of the Coconut Cultivation Board and the members of the Coconut Research Board held on 23 February, 18 March and 8 April, respectively. Participants were given a conducted tour of the garden on each such occasion.

Distinguished visitiors included Dr. B. Thapa, Resident Representative, UNDP and Mr. K. Kawaguchi, FAO Representative in Sri Lanka. Mr. Richard Coe, Consultant Statistician from Reading University and Mr. Ian Dale from the same Department spent a few days in the Division engaged in collaborative research; several publications are expected to result from this work. Dr. N. Haq of Southampton University, UK, visited for discussions of the courses relevant to our work offered by them.

Trainees from overseas included Mr. Vo Van Long and Mr. Huc Dug Troung from Vietnam and Messrs. Abdul Malik Soomro, Mehdi Imam, Nisar Ahmed Kazi and Manzoor Ali Memon, FAO fellows from Pakistan. Mr. Vo Van Long of the Research Centre For Oils and Oil plants, Vietnam, spent a period of nearly five months in this division while three of the fellows from Pakistan were on attachment training here for six weeks.

Trainees from the Coconut Development Training Centre (CDTC), National Institute of Plantation Management (NIPM), and the National Apprenticeship Board (NAB) were shown around the laboratories and informed of the activities of the division. Some of these also visited the Isolated Seed Garden.

## 9 LECTURES, SYMPOSIA, STUDY TOURS ETC.

Dr. M. R. T. Wickramaratne was appointed National Consultant to the Asian and Pacific Coconut Community (APCC) with effect from January 1987 and commissioned to undertake a survey on the performance of "New Vatieties of Coconut" and submit a report on the Sri Lankan experience.

Dr. M. R. T. Wickramaratne attended a Joint Meeting of the Working Group on Genetic Improvement (FAO) and the Working Group on Palms (International Board for Plant Genetic Resources, IBPGR) as country representative for Sri Lanka. The Meeting was held in the Philippine Coconut Authority (PCA) Zamboanga Research Centre Zamboanga City, Philippines from 27-29 January. Two papers, entitled "Genetic Improvement of Coconuts-Country Report for Sri Lanka" and "Coconut germplasm collection" with an annexure on "Coconut varieties in Sri Lanka", were presented by her at this meeting after which she made a study tour, visiting the PCA Zamboanga and Davao Research Centers, Twin Rivers Research Center at Hijo, The International Rice Research Institute (IRRI), The University of Philippines at Los Banos and the Philippine Coconut Authority Central office at Manila over a period of about ten days.

Mrs. W. M. U. Fernando, Assistant Geneticist and Plant Breeder, participated in the International Coconut Breeding Course in Manado, Indonesia, organised by UNDP/ FAO from 27 June to 13 July. The course consisted of lectures, practical demonstrations in laboratory and field and field tours Mrs. Fernando presented a country report on "Coconut Breeding in Sri Lanka" at this course.

Mr. W. G. A. Ratnasiri and Mrs. I. J. S. Kondasinghe, Research Assistants, participated in a course on "Statistics and Computer Application in Agriculture" at the University of Colombo, Sri Lanka, from 9 March to 10 April.

Mrs. W. M. U. Fernando and Mr. W. G. A. Ratnasiri participated in the Coconut Research Conference held at Koggala on 18 May. Their presentations were on "Improved planting material" and "Planting systems and densities" respectively.

Lectures for the Diploma in Plantation Management Course of the National Institute of Plantation Management were delivered as follows: "Varieties and improved planting material," "Techniques of controlled pollination"' and "Planting distances and systems" by Dr. M. R. T. Wickramaratne and "Seednut supply for the national planting programme" by Mr. P. Kariyawasam. Dr. M. R. T. Wickramaratne and Mrs. I. J. S. Kondasinghe accompanied the trainees on the field demonstrations at the Isolated Seed Garden, Ambakelle.

The third refresher course in Nursery Management for Nursery Officers of the Coconut Cultivation Board was organised by this Division in conjunction with CCB at CDTC in the Sinhala Medium on 8-11 September. The staff of this Division were involved during the first three days of the programme which consisted of lectures held at CDTC, field demonstrations at Bandirippuwa Estate and a general discussion. The organization and provision of facilities for trainees were by CCB and CDTC while eight lectures were given by resource persons from the Division.

Research staff of this Division also acted as resource persons for the following :

Training course for Extension Officers of the Coconut Cultivation Board on 22 June and 21 July at which Mrs. W. M. U. Fernando delivered three lectures on "Planting in the field," "New recommendations on planting densities" and "The Isolated Seed Garden."

Discussion on 15 October of "Varieties and forms of Coconuts" with staff of the Dept. of Agriculture, organised by the CDTC in which Mr. W. G. A. Ratnasiri participated.

Meeting of the members of the Dunagaha Coconut Producers Society on 19 December, organised by the CCB, at which Mr. W. G. A. Ratnasiri spoke on "New recommendations for planting densities of coconuts."

Several meetings of Coconut Development Officers were organised, country wide in order to brief them on their role in germplasm collection and to obtain information regarding local and improved coconut varieties. Altogether five meetings were held commencing with a meeting at the Coconut Development Training Centre on 22 August with Coconut Development offices from different parts of the country. Four other meetings were held at the Coconut Cultivation Board Regional Offices at Galle, Hambantota, Ratnapura and Kuliyapitiya on 27 October, 29 October, 24 November and 17 December respectively. with the Coconut Development Officers of the region together with Regional Managers and Assistant Regional Managers. These meetings were atteneded by several staff members of the division who briefed the field staff on "The assessment of improved varieties" and "Germplasm collection and local coconut varieties." The meetings were well attended by CCB officers and found to be extemely useful;

The Divisional seminars, begun last year, for the purpose of keeping the staff of the division informed of ongoing activities and recent research findings were successfully continued. Five seminars were organised during the year, as follows:

Seednut Production—Mr. P. Kariyawasam
Coconut Breeding in Indonesia—Mrs. W. M. U. Fernando
The position of the soft eye in coconut and its relation to laying of seednuts in the nursery—Mr. M. H. L. Padmasiri
Seednut selection—Miss. M. A. S. Fernando
Variation in nut numbers and nut weights—Mrs. W. B. S. Fernando.

Dr. M. R. T. Wickramaratne was appointed in December to the Committee for recognition of Private Coconut Nurseries, consisting of senior officers from the CCB and the CRI, set up to examine and submit recommendations regarding requests received for recognition of Private Coconut Seedling Nurseries for the purpose of issuing seedlings for planting under the CCB subsidy schemes.

## 10. PUBLICATIONS


Attanayake, Ranasinghe Banda & W. M. U. Fernando (1987) *Thembili. Coconut Bulletin* 4(1) : 26

Fernando, W. M. U. (1987). *San Ramon*—big with promise, *Coconut Bulletin* 4(1) : 15

Padmasiri, M. H. I. 1987). Pollination. *Coconut Bulletin* 4(1) : 28 - 31

Pathirage, D. M. & Pathirana H. P. P. H. (1987). The Isolated Seed Garden,Ambakelle. *Coconut Bulletin* 4(1) : 24-25

Samarasinghe, Harischandra (1987). New techniques in pollen collection and processing. *Coconut Bulletin* 4(1) : 31

Wickramaratne, M. R. T. (1987). Breeding coconuts for adaptation to drought. *Coconut Bulletin* 4(1) : 16-23

Wickramaratne, M. R. T. (1987). Coconut germplasm collection. A country report (mimeographed) prepared for the joint meeting of the IBPGR/SEAP Working Group on Palms and Working Group on Genetic Improvement of FAO Project RAS 80/032, 27-29 January 1987. PCA-ZRC, Zamboanga City, Philippines

Wickramaratne, M. R. T., Richard Coe & Suneetha Fernando (1987). Evaluation of criteria for selection of seed coconuts. *Cocos* 5 : 1-7


## 11. REFERENCES


1. Rognon, F. (1976) Floral biology of the coconut—duration and sequence of male and female phases in various types of coconuts. Oleagineux 31(1) : 13-18
2. Sangare, A., Rognon, F. & Nuce de Lamothe, M. (1978). Male and female phases in the inflorescence of the coconut. Oleagineux 33(12) : 609-617
3. Ohler, J. G. (1984). *Coconut, tree of life*. FAO Plant Production and Protection Paper 57, Food and Agriculture Organization of the United Nations, Rome. 446 pp.
4. Ratnayake, P. A. N. (1985). Report of the Coconut Processing Research Division in Coconut Research Institute of Sri Lanka Report for 1985.


## 12. ACKNOWLEDGEMENTS


The assistance of the staff of the Genetics & Plant Breeding Division in compiling this report is greatly appreciated. It is also a pleasure to acknowledge the contribution of our field staff who continue to give their best.

## REPORT OF THE SOILS AND PLANT NUTRITION DIVISION

**Head—M. Jeganathan, M. Phil.**

### 1. GENERAL

**Promotions :**

Mr. M. Jeganathan, Research Officer, Executive Grade, Class II to Class I, 10 June.

Miss S. Periyathamby, Technical Assistant, Technical Grade, Class I to Special Class, 1 January, 1985.

Mrs. D. M. D. I. Wijebandara, Technical Assistant, Technical Grade, Class II to class I, 1 January, 1986.

Mr. A. A. Fernando, Laboratory and Field Assistant, Operative Grade Class I to Special Class, 1 January, 1985.

**Transfers:**

Mr. L. Vancuylenburg, Labourer was transferred to the Division from the Estate Management Division on 10 September.

**Study Leave and Training :**

Mr. K. S. Jayasekera, Research Assitant, attended a 'College on Soil Physics' from 2 to 20 November, sponsored and held at the International Centre for Theoretical Physics (ICTP), Trieste, Italy.

Miss M. N. Dias, Research Assistant, continues her overseas study leave at the University of Queensland, Australia.

Mr. L. L. W. Somasiri, Research Assistant, attended the course 'Statistics and Computer Application in Agriculture' from 9 March to 10 April, organised jointly by the Department of Statistics and Computer Science, University of Colombo, Sri Lanka and the Statistical Services Centre, Department of Applied Statistics, University of Reading, U. K. held at the Computer Centre, University of Colombo.

Mr. N. A. Tennakoon, Research Assistant, participated in a training programme on "Fertilizer and Compost Technique" held at the University of Ghent, Belgium from 1 September to 15 October under the aegis of the Food and Agriculture Organisation.

Mr. L. P. Vidhana Arachchi, Research Assistant, attended a training course in Colombo on 'Micro-Computers and Basic Programming', organised by the Department of Census and Statistics in collaboration with the Statistical Institute for Asia and the Pacific (SIAP), Tokyo, Japan, from 16 September to 6 October.

Mrs. N. H. R. M. de Silva, Technical Assistant, attended the UNESCO Regional Workshop on 'Field Oriented Analytical Chemistry' from 10 to 13 November, at the Centre for Analytical Research and Development, (CARD), Universtiy of Colombo and the Ceylon Institute of Scientific and Industrial Research, Colombo.

Mr. N. P. Guneratne, Technical Assistant, Participated in the Workshop on Repair and Maintenance of Analytical Equipment, Course-Electronics II, sponsored by the British Council and held in Colombo from 11 to 21 August

**Academics :**

Mrs. D. M. D. I. Wijebandara, Technical Assistant, obtained B. Sc. degree in November, as an external student of the University of Peradeniya.

**Trainees :**

Miss. E. P. L. N. Sriyalatha, an undergraduate from the University of Ruhuna conducted a research project for her degree from 20 April to 30 November on "Some Preliminary studies on the use of coir dust for soil improvement", under the supervision of Mr. K. S. Jayasekara.

**Membership of Professional Bodies**

Mr. K. S. Jayasekera, Research Assistant, has been admitted as a member of the Institute of Chemistry Ceylon, with effect from 5 June.

## 2. LABORATORY, GLASSHOUSE AND FIELD INVESTIGATIONS

**Studies on coir dust as a soil ameliorant**

Laboratory studies on the use of coir dust as a soil ameliorant were conducted to evaluate the water holding capacity, nitrogen availability, and plant response to different combinations of coir dust to soil.

(*a*) Results showed that gravimetric moisture content of coir dust at field capacity is 1112 X 18%

The optimum ratio for water holding capacity was found to be 5% v/v, coir dust : soil.

(*b*) Polythene bags filled with 300 g of pre-seived, air-dried coir dust were mixed with different rates of urea. Nitrogen availability was monitored at specified time durations, after incubation, at field capacity.

Results indicated that the optimum availability of nitrogen was at 2% w/w urea; coir dust mixture, 36 days after incubation, at field capacity.

(c) Plastic pots (15 cm diameter, 15 cm height) were filled with different ratios of coir dust : sand to evaluate the growth of coir grass (*Brachiaria milliformis*). The maximum dry matter production was obtained with 2% urea w/w and 180,000 kg/ha coir dust rates.

A significant observation in these studies was the reduction of root growth with increase in coir dust.

Further investigations are in progress.

*E. P. L. Sriyalatha, L. P. Vidhana Arachchi and K. S. Jayasekara*

Studies on Vesicular Arbuscular Micorrhizae in Coconut.

**Experiment 7.10—The occurrence of Vesicular Arbuscular Mycorrhizae (VAM) in coconut (1987)**

The objectives of this study are :

(i) To establish the presence of VAM in typical coconut growing soils of the wet, intermediate and dry zones of Sri Lanka.

(ii) To study the infection level in coconut roots and the relationship between root infection and (a) spore density (b) soil type and (c) climatic condition.

Root samples and soil from the rhizosphere were collected from the following locations :

(*a*) Wet zone — Lateritic gravel, sandy loam (Walpita Estate, Kotadeniyawa)

(*b*) Intermediate zone — Lateritic gravel, sandy loam (Ratmalagara Estate, Madampe)

(*c*) Dry zone — Lateritic gravel, (Thammatha Estate, Kumara-Kattuwa)

— Sandy loam (Pothukulama Research Station, Pallama).

Analysis of samples is in progress

*M. G. F. S. Ferdinandes*

**Experiment 7.11—Effect of Vesicular Arbuscular Mycorrhizae (VAM) on growth of coconut and uptake of phosphorus from Eppawala Rock Phosphate (ERP) (1987).**

This greenhouse experiment was initiated in order to select an efficient VAM fungus for coconut from the indigenous spore population in coconut growing soils and to assess the influence of VAM on the uptake of phosphorus from Eppawala Rock Phosphate (less soluble source of phosphate).

Treatments :
1. Coconut without inoculation
2. Coconut + Inoculum A
3. Coconut + Inoculum B
4. Coconut + Inoculum A + ERP
5. Coconut + Inoculum B + ERP
6. Coconut + Superphosphate
7. Coconut + Inoculum A + Inoculum B
8. Coconut + Inoculum A + Inoculum B + ERP
9. Coconut + ERP

Inoculum A, Inoculum B — Two mycorrhizal strains

Design — Randomized Block Design with 9 replicates

Selection of mycorrhizal strains for the inoculum (Inoculum A and Inoculum B) is in progress from the coconut rhizosphere soil samples, collected during the survey (Expt. 7.10), on the basis of spore density.

Initially, the selected strains would be cultured on leguminous cover crops normally associated with coconut. *Centrocema pubescence* was established in plastic pots for this purpose.

Concurrently, coconut seednuts were sterilized using 1% sodim hypochlorite and planted in nursery beds. Sterilized using Methyl Bromide. Five months after germination, the nuts were transplanted in sterilized soil in large plastic bins.

It is hoped to introduce infected roots from cover crops into the bins containing seedlings. The growth parameters root infection, fresh and dry weights and nutrient status of the seedlings would be studied.

*M. G. F. S. Ferdinandes*

## 3. RESEARCH PROJECTS

### PROJECT 1—STUDIES ON THE IMPROVEMENT OF SOIL ORGANIC MATTER STATUS AND WATER HOLDING CAPACITY

**Experiment 1.5.1—Effect of coir dust on the physical condition of the soil at Heemmeliyagara Estate, Hiruwalpola (1984).**

It was decided to continue the experiment, but to suspend any further application of coir dust. Hence the treatments $T_3$ $T_4$ and $T_5$ have received a total of 7407, 14815, and 22222 kg of coir dust/ha respectively. Effect of these low rates of coir dust on improvement to soil and the yield of coconut will be monitored.

Manuring was completed according to the treatments (Annual Report, 1985) in May, and regular cultural practices and yield recordings were carried out.

Infiltration rate, water holding capacity, bulk density, root density, and weed growth were measured in the manure circle and in the centre of square of the different treatments during September-October.

*K. S. Jayasekara and L. P. Vidhana Arachchi*

**Experiment 1.5.2—Effect of coir dust on the physical condition of the soil, Marichchikati Estate, Madurakuliya (1984; modified 1987).**

Several laboratory investigations were conducted to obtain basic information on moisture characteristics of coir dust, soil and their mixtures. This revealed the necessity to increase the rate of coir dust applied, and the treatments were appropriately modified as follows :

Modified treatmets :

$T_1$ — Control (no fertilizer and no coir dust)
$T_2$ — Fertilizer only (APM 3 kg/palm/year)
$T_3$ — Fertilizer + Coir dust 45000 kg/ha
$T_4$ — Fertilizer + Coir dust 90000 kg/ha
$T_5$ — Fertilizer + Coir dust 135000 kg/ha
$T_6$ — Fertilizer + Coir dust 180000 kg/ha

The modified experiment is a "supplemented balance" design with 5 blocks and 5 plots per block, where the supplementing treatment is the control ($T_1$). Plots $T_1$ and $T_2$ continued to have the same treatments while other plots received increased rates of coir dust.

Manuring of palms with 3 kg of APM per palm was completed in November and. the experiment was maintained with regular yield recordings and weedings. Infiltration rates, bulk density and weed growth were measured in September-October.

Application of the modified coir dust treatments was commenced in December Fresh coir dust ("moist" coir dust density 0.309 $\pm$ 0.2028 g/cm$^3$) was directly collected from a coconut fibre mill. The required amount of coir dust was manually spread on each coconut square, excluding the manure circle, using volume-calibrated baskets. A tractor with a disc harrow followed by a rotovator was used to mix the coir dust with the top 10 cm of soil.

*K. S. Jayasekara and L. P. Vidhana Arachchi*

## PROJECT 7—STUDIES ON THE NUTRIENT REQUIREMENT OF COCONUT-PARTICULARLY UNDER STRESS CONDITIONS

### Experiment 7.1—Effect of NPK fertilizer and organic manure on coconut (CRIC 65). Bandirippuwa Estate, Lunuwila, (1984).

Samples from 14th leaf were collected in May, 1987. Fourth uniform application of 4.5 kg/palm/year of CU-1 mixture to all the palms and third application of 20 kg of goat dung, in addition to CU-1, to half the palms (3) in each treatment plot was done in June. 750 g of epsom salt was also applied to each palm for the second time in June. The soil application of epsom salt corrected to a considerable extent the visible symptoms of magnesium deficiency.

The yield records were maintained in terms of nuts but, before the recording of copra yield, some of the nuts were lost. Female flower production was also recorded. For the first time, after three years of cumulative treatment, the palms receiving goat dung + CU-1 mixture gave a significantly higher nut yield than the palms receiving CU-1 mixture only ($P = 0.001$). The average annual nut yield from a goat dung + CU - 1 treated palm was 50, whereas that of a CU-1 only treated palm was 34. The overall low yield of palms may be attributed to the magnesium deficiency that prevailed in this experiment for more than four years and the non-uniformity of the experimental palms.

Female flower production was significantly higher ($P = 0.05$) in goat dung + CU-1 treated palms than the CU-1 treated palms for the same year. The number of female flowers produced during the year by goat dung + CU-1 treated palm was 165, compared to 135 in palms receiving CU-1 treatment.

### Experiment 7.6.1—Levels of organic manure (goat dung) supplemented with inorganics at Heemmeliyagara Estate, Hiruwalpola (1984).

Analysis of the third set of leaf samples (second year after manuring), collected in December, 1986 was completed in January, 1987. Statistical analysis of the data for the 14th leaf showed a significant reduction ($P = 0.05$) of leaf N for treatments, 5, 12, and 14 and leaf K for treatments 1,4 and 10 (Table 1).

**Table 1** *Treatment effect on leaf N & K concentration 14th leaf*

| | *Treatment/palm* | | | | | *%N* | *Significance* |
|---|---|---|---|---|---|---|---|
| | *U* | *GD* | *SP* | *MOP* | *Dol* | | |
| | *(g)* | *(kg)* | *(g)* | *(g)* | *(g)* | | |
| $T_5$ | 240 | 6 | 260 | 730 | 500 | 1.927 | * |
| $T_{12}$ | 50 | 18 | 150 | 1200 | 500 | 1.950 | * |
| $T_{14}$ | 0 | 24 | 0 | 535 | 500 | 1.683 | * |
| | | | | | | %K | |
| $T_1$ | 0 | 0 | 0 | 0 | 500 | 0.850 | ** |
| $T_4$ | 0 | 6 | 0 | 0 | 500 | 0.953 | ** |
| $T_{10}$ | 0 | 18 | 0 | 0 | 500 | 0.880 | ** |

1 U — Urea
GD — Goat Dung
SP — Saphos Phosphate
MOP — Muriate of Potash
DO1 — Dolomite

Analysis of the third set of soil samples collected at the same time is in progress.

The third differetnial application of organic manure supplemented with inorganics was completed in May, 1987.

Statistical analysis of yield in terms of nuts and copra at the end of second year showed no significant difference between treatments.

*N. A. Tennakoon*

**Experiment 7.6.2—Levels of organic manure (goat dung) supplemented with inorganics at Saraswathie Estate, Divulapitiya (1985).**

Analysis of the second set of leaf samples (the first year after manuring) collected in May, was completed in December. Statistical analysis is in progress.

Analysis of the second set of soil samples, collected on the same occasion is in progress.

Statistical analysis of the yield data collected during the first year after differential treatment showed no significant difference between treatments.

The second differential application of organic manure (goat dung) with inorganic supplements was done in July.

**Microbiological Studies**

This experiment is also used for studies on organic manure transformation.

(A) Studies on organic transformation

**(i) Depths of sampling**

After the first differential treatments, soil samples were collected from two depths, 0-8 nad 8-16 cm, at intervals of 45 days. Four such sampling were done to May, 1987.

Studies on the microbiological activity of the samples at these depths, showed a marked increase in the total number of bacterial colonies up to 135 days after treatment and then a steady decline.

Results also showed no difference in microbiological activity at the two depths viz. 0-8 and 8-16 cms. Therefore, sampling for the second year(i.e.second year after treatment) was confined to one depth (0-8 cm) and distributed in all three blocks for statistical purposes.

From June soil sampling confined to 0.8 mm depth was done at monthly intervals. Six such samplings were done in 1987. Analysis of samples is in progress..

**(ii) Single Vs Composite sampling**

Simultaneously, investigations were also carried out to study differences between single samples as against composite samples. 'Single sample' represents soils collected from the base of individual palms. 'Composite sample' respresents, a mixture of soils collected from bases of more than one palm. In this study, soil samples from the bases of three palms representing a *plot*, were studied as single samples as well as a composite sample by mixing together. No difference was observed in the number of total bacterial colonies and total fungal colonies, determined by the 'Dilution Plate Technique' in soil samples taken in this manner. Based on these results, composite samples were used thereafter.

**(iii) Identifying parameters for microbiological activity**

The samples were also analysed for parameters concerned with micro-biological activity (numbers of total bacterial/fungal colonies, total biomass 'C' produced, rate of $CO_2$ evolution, and rates of mineralization and nitrification), the factors controlling these activities (e.g. moisture, pH) and their effects on nutrient status.

Relationships were identified between these factors relating to microbiological activity with time expressed by the equation :

$$\underset{(y)}{\text{Log}_{10}(x)} = a + bx + cx_2$$

Where x = time,
y = number of toal bacterial colonies (response)
a, b & c = constants

This study, confined to a single block showed that easily measurable parameters for the purpose of microbiological studies in organic matter transformation can be identified. However, for statistical requirements these studies are being extended to all three blocks (replicate) to be sampled and analysed simultaneously to draw firm conclusions.

(B) Determination of the rate of decomposition of goat dung

This study was commenced in June, 1987.

Thirty gram samples of goat dung pellets containing 9% moisture were bagged in nylon mesh (size 0.05 - 0.5 mm) and buried in the manure circle at 0-8 cm depth. of selected palms at the rate of 12 bags per palm receiving treatment combination (GD-12 kg, urea 260 g, Sp 330, MP 1330 g, Dol. 500 g) and control (no fertilizer). The treatments were repeated in five palms. Ten bags were removed at monthly intervals for analysis.

Each sample was analysed for the dry weight of the remaining contents of each bag for organic carbon, total N, P and K. Analysis of data is in progress.

*N. A. Tennakoon*

**Experiment 7.6.3—Levels of organic manure (goat dung) supplemented with inorganics, at Kiniyama Estate, Weerapokuna. Sandy loam, Intermediate zone (1984).**

The chemical analysis of the third set of leaf samples (the second year after manuring), collected in December, 1986, was completed in April. Statistical analysis of mineral nutrients in the 14th leaf showed no significant differences between treatments.

The chemical analysis of the third set of soil samples (the second year after manuring), collected in December, 1986 is in progress.

The third differential application of organic manure with inorganic supplements was completed in May.

Statistical analysis of yield in terms of nuts and copra, at the end of the second year, showed no significant difference between treatments.

It was observed that a total of 34 experimental palms were affected by drought during the year. There was no correlation between treatments and the drought affected palms. At the end of the year some of the partially affected palms recovered after the rains.

*N. A. Tennakoon*

**Experiment 7.7—Nutrient requirements of coconut, based on soil and tissue analysis (1984)**

(a) Leaf analysis was used as a diagnostic tool for fertilizer modification in 16 Estates. Deficiencies due mostly to K and Mg were identified.

(b) FAO Fertilizer Project for Small Farmers.

The implementation of the IInd phase of the programme was much delayed. However a new Co-ordinator was appointed by the FAO in May.

At the request of the Coconut Research Board, the FAO appointed a local Consultant to critically review the available 113 demonstration sites, and to make recommendations on the continuation of the programme. The Consultant commenced field visits in September. Two officers from the Coconut Research Institute, Messrs G. D. George and N. P. Guneratne assisted him in the survey. A steering Committee for monitoring the project activities was established, and Mr. L. L. W. Somasiri from the Coconut Research Institute and Mr. M. D. H. de Silva from the Coconut Cultivation Board were assigned the task of coordinating and supervising the demonstration sites.

Two meetings and a seminar were held between September and November to apprise the Regional Managers, Assistant Regional Managers and the Coconut Development Officers involved in the implementation of the project, of the objectives of the programmes and to discuss the modalities of cooperation during phase II.

During the year, yield records of all 113 sites were maintained by the Coconut Development Officers of the Coconut Cultivation Board. The data will be analysed by the FAO.

Leaf samples collected by the CRI in 1986/87 will be analysed, no sooner the report of the Consultant is finalized, as it is likely that some of the sites may be abandoned.

*M. Jeganathan, L. L. W. Somasiri and G. D. George*

**Experiment 7.8—Effect of chloride and sulphate of K, Mg and Na on the yield of coconut at Heemmeliyagara Estate, Hiruwalpola (1984).**

Samples from 6th and 15th leaf were collected in September, prior to the second differential fertilizer treatment. The chemical analysis of leaf samples is in progress. The third differential fertilizer treatment was completed in October.

The chemical analysis of leaf samples collected prior to the first differential treatment revealed that K and S levels in all plots were below the critical leaf nutrient levels for the respective elements. The N content in some plots was within the sufficiency level and in most bordered the critical value of 1.9%. The levels for Cl were satisfactory.

The chemical analysis of leaf samples collected one year after the first differential treatment continued to indicate K deficiency in palms in all plots while a number of plots indicated N deficiency. Leaf Cl level in chloride-treated plots ($T_4$-$T_9$) was well above the sufficiency values. The difference in leaf Cl level between chloride treated plots and other plots ($T_{10}$-$T_{14}$) was significant (P=0.001). Sulphur levels in all plots were within the critical levels specified by Manciot *et al.* (1979) irrespective of the $SO_4$ or Cl source applied.

Yield in terms of nuts and copra in the first and the second year after differential treatment showed no significant difference between treatments.

The treatment combinations are given in Table 2.

*L. L. W. Somasiri and N. A. Tennakoon*

**Table 2** *Treatment schedule with two levels of chloride and sulphate of K, Mg and Na*

*(U—Urea 46% N, SP—Saphos Phosphate 27.5% $P_2P_5$)*

| *Treatment* | *Source* | *Rate (kg/palm/y)* |
|---|---|---|
| $T_1$ | Control | |
| $T_2$ | U + SP | 0.700 + 0.700 |
| $T_3$ | KCl | 0.800 |
| $T_4$ | KCl | 1.600 |
| $T_5$ | NaCl | 0.627 |
| $T_6$ | NaCl | 1.254 |
| $T_7$ | $MgCl_2$ | 0.511 |
| $T_8$ | $MgCl_2$ | 1.022 |
| $T_9$ | $K_2SO_4$ | 0.937 |
| $T_{10}$ | $K_2SO_4$ | 1.874 |
| $T_{11}$ | $Na_2SO_4$ | 0.762 |
| $T_{12}$ | $Na_2SO_4$ | 1.524 |
| $T_{13}$ | $MgSO_4$ | 0.646 |
| $T_{14}$ | $MgSO_4$ | 1.292 |

(From $T_3$ to $T_{14}$, a basal application of U and SP as in $T_2$)

**Experiment 7.9.1—Studies on K-Mg interaction in coconut at Heemmeliyagara Estate, Hiruwalpola (1984) (CIDA Funded Project).**

Statistical analysis of yield data, for the years 1986 and 1987, in terms of nuts and copra showed neither a significant response to the main treatments K and Mg nor a significant interaction between them. The third differential fertilizer application was carried out in May. Application of fertilizer in 1987 was delayed due to drought. This delay, combined with drought and the age of palms could have affected the response to treatments.

**Leaf Analysis**

The third set of leaf samples, collected in December 1986, was analysed for N,P,K, Ca, Mg and Cl. The results show cumulative responses to the two differential fertilizer applications of January, 1985 and February, 1986.

Application of increased rates of K resulted in significant changes in leaf K, Ca and Mg. and also its interaction with K showed no such changes in any of the nutrients.

**Table 3** *Nurient concentration in leaf due to differential application of K and Mg*

*Heemmeliyagara Estate—December, 1986*
*14th leaf—% D. M.*

| *Treatment* | *N* | *P* | *K* | *Ca* | *Mg* |
|---|---|---|---|---|---|
| $K_1$ | 2.058 | 0.128 | 1.059 | 0.458 | 0.336 |
| $K_2$ | 2.011 | 0.128 | 1.282 | 0.448 | 0.312 |
| $K_3$ | 2.080 | 0.127 | 1.291 | 0.416 | 0.294 |
| $K_4$ | 2.107 | 0.130 | 1.337 | 0.398 | 0.279 |
| $Mg_1$ | 2.099 | 0.130 | 1.272 | 0.423 | 0.288 |
| $Mg_2$ | 2.039 | 0.127 | 1.209 | 0.449 | 0.318 |
| $Mg_3$ | 2.108 | 0.128 | 1.263 | 0.413 | 0.302 |
| $Mg_4$ | 2.079 | 0.128 | 1.224 | 0.433 | 0.313 |
| $K_1Mg_1$ | 2.077 | 0.130 | 1.013 | 0.487 | 0.320 |
| $K_1Mg_2$ | 2.063 | 0.127 | 0.937 | 0.463 | 0.357 |
| $K_1Mg_3$ | 2.063 | 0.127 | 1.173 | 0.467 | 0.333 |
| $K_1Mg_4$ | 2.027 | 0.130 | 1.113 | 0.417 | 0.333 |
| $K_2Mg_1$ | 2.083 | 0.130 | 1.203 | 0.403 | 0.297 |
| $K_2Mg_2$ | 1.990 | 0.123 | 1.317 | 0.503 | 0.310 |
| $K_2Mg_3$ | 2.187 | 0.127 | 1.250 | 0.437 | 0.307 |
| $K_2Mg_4$ | 2.063 | 0.130 | 1.360 | 0.447 | 0.337 |
| $K_3Mg_1$ | 2.123 | 0.127 | 1.533 | 0.393 | 0.267 |
| $K_3Mg_2$ | 2.033 | 0.127 | 1.260 | 0.407 | 0.307 |
| $K_3Mg_3$ | 2.070 | 0.130 | 1.233 | 0.397 | 0.310 |
| $K_3Mg_4$ | 2.093 | 0.123 | 1.137 | 0.467 | 0.293 |
| $K_4Mg_1$ | 2.113 | 0.133 | 1.340 | 0.410 | 0.267 |
| $K_4Mg_2$ | 2.070 | 0.130 | 1.323 | 0.423 | 0.300 |
| $K_4Mg_3$ | 2.110 | 0.127 | 1.397 | 0.353 | 0.260 |
| $K_4Mg_4$ | 2.133 | 0.130 | 1.287 | 0.403 | 0.290 |
| Sig. Level | | | | | |
| $K_1$ | — | — | *** | * | ** |
| q | — | — | * | — | — |
| Mg | — | — | — | — | — |
| K x Mg | — | — | — | — | — |
| CV (%) | 4.05 | 5.16 | 11.64 | 16.53 | 15.64 |

* P = 0.05; ** P = 0.01; *** P = 0.001
1 — linear response; q — quadratic response

Leaf K showed a significant quadratic response and Ca together with Mg showed a significant linear decrease for the increased rates of K. This is the classical antagonistic effect of excess K causing depressive effects on the uptake of Ca and Mg.

**Table 4** *Nutrient concentration in nut water due to differential application of K and Mg*

*Heemmeliyagara Estate — May,* 1987

*(Concentration in ppm)*

| *Treatment* | *Na* | *K* | *Ca* | *Mg* | *Cl* |
|---|---|---|---|---|---|
| $K_1$ | 148 | 2058 | 286 | 136 | 1987 |
| $K_2$ | 103 | 2246 | 279 | 127 | 2036 |
| $K_3$ | 90 | 2230 | 265 | 120 | 2037 |
| $K_4$ | 76 | 2419 | 275 | 118 | 2118 |
| $Mg_1$ | 107 | 2207 | 280 | 122 | 2058 |
| $Mg_2$ | 102 | 2176 | 288 | 128 | 1997 |
| $Mg_3$ | 99 | 2288 | 272 | 123 | 2026 |
| $Mg_4$ | 109 | 2283 | 266 | 129 | 2091 |
| $K_1Mg_1$ | 157 | 2028 | 306 | 127 | 2043 |
| $K_1Mg_2$ | 162 | 1912 | 297 | 133 | 1849 |
| $K_1Mg_3$ | 91 | 2307 | 266 | 133 | 2005 |
| $K_1Mg_4$ | 182 | 1987 | 272 | 150 | 2029 |
| $K_2Mg_1$ | 125 | 2213 | 295 | 122 | 2023 |
| $K_2Mg_2$ | 79 | 2141 | 290 | 134 | 1997 |
| $K_2Mg_3$ | 115 | 2214 | 285 | 123 | 2007 |
| $K_2Mg_4$ | 93 | 2416 | 248 | 130 | 2116 |
| $K_3Mg_1$ | 82 | 2225 | 227 | 117 | 2101 |
| $K_3Mg_2$ | 94 | 2215 | 302 | 123 | 2022 |
| $K_3Mg_3$ | 105 | 2198 | 259 | 121 | 1984 |
| $K_1Mg_1$ | 79 | 2286 | 273 | 118 | 2039 |
| $K_4Mg_1$ | 64 | 2361 | 293 | 121 | 2063 |
| $K_4Mg_2$ | 74 | 2437 | 262 | 120 | 2121 |
| $K_4Mg_3$ | 83 | 2433 | 277 | 115 | 2108 |
| $K_4Mg_4$ | 82 | 2444 | 269 | 116 | 2179 |
| Sig. Level 1 | *** | ** | — | ** | * |
| K | | | | | |
| a | — | — | — | — | — |
| Mg | — | — | — | — | — |
| K x Mg | — | — | — | — | — |
| CV (%) | 35.00 | 9.40 | 15.40 | 11.19 | 5.75 |

* P = 0.05; ** P = 0.01; *** P = 0. 001

1 = linear response, q = quadratic response

As in the case of leaf analysis, only the increased rates of K caused changes in Na K and Mg. However, no response was indicated for Mg or its interaction with K.

**Nut Water Analysis**

Nut water analysis developed as a routine method (Annual Report 1986) was used on the nut water samples from experiments 7.9.1 and 7.9.2 for estimation of Na, K, Ca, Mg and Cl. Nut water samples from the different treatment combinations were collected in May, 1987 and analysed for Na, K, Ca, Mgand Cl. The date are presented in (Table 4).

**Sodium :** Increased rates of K caused a highly significant ($P < 0.001$) linear decline in the Na status. There appears to be a depressive effect on Na uptake with increased rates of applied K.

**Potassium and Magnesium :** Increased rates of applied K caused a linear increase of K and decrease of Mg in nut water. This is similar to the trends observed in the leaf, but had no effect on Ca.

**Chlorine :** Increased rates of K also caused linear increase in Cl in nut water, probably the effect of the Cl component in the KCl (muriate of potash) used as the fertilizer ingredient.

These observations suggest that nut water analysis could be used as a diagnostic tool in the study of the nutrition of coconut.

*M. Jeganathan, S. Periyathamby, D. M. D. I Wijebandara and A. A. Fernando*

**Experiment 7.9.2—Studies on K-Mg interaction in coconut at Sirikandura Estate, Dodanduwa (1984).**

Statistical analysis of the nut yield of the second year of the experiment, covering the period April 1986 to February, 1987 did not show a response to treament, but showed significant difference at $P = 0.01$ for K treatments (Table 5). This is primarily due to the improvement in the K nutrition of the palm which contributes to copra production.

**Table 5** *K-Mg Interaction studies*

*Yield from April* 1986 *to February* 1987

*Kg copra/ha—*158 *palms/ha*

| | *Treatment/palm/year* | *Kg/copra/ha* | % | *Difference kg/copra/ha* |
|---|---|---|---|---|
| $K_1$ | 0.0 | 1668 | 100 | — |
| $K_2$ | 1.2 | 1882 | 113 | 214 |
| $K_3$ | 2.4 | 1985 | 119 | 317 |

**Leaf Analysis**

Chemical analysis of leaf samples collected in May, 1986 (14 months after the first differential fertilizer application) showed highly significant (P = 0.001) changes in the status of K, Mg and Cl for increased rates of K and for Ca, Mg and Cl (P. = 0.05) for increased rates of Mg (Table. 6).

**Table 6** *Leaf nutrient levels due to differential application of K and Mg*

*Experiment* 7.9.2

(14*%th leaf % D.M.*)

*Sirikandura Estate—May* 1986

| *Treatment* | *N* | *P* | *K* | *Ca* | *Mg* | *Cl* |
|---|---|---|---|---|---|---|
| $K_1$ | 2.26 | 0.15 | 0.88 | 0.39 | 0.171 | 0.56 |
| $K_2$ | 2.35 | 0.16 | 1.16 | 0.38 | 0.136 | 0.72 |
| $K_3$ | 2.32 | 0.15 | 1.32 | 0.35 | 0.132 | 0.74 |
| $Mg_1$ | 2.27 | 0.15 | 1.16 | 0.34 | 0.134 | 0.73 |
| $Mg_2$ | 2.33 | 0.16 | 1.09 | 0.39 | 0.146 | 0.65 |
| $Mg_3$ | 2.34 | 0.16 | 1.11 | 0.39 | 0.159 | 0.64 |
| $K_1Mg_1$ | 2.27 | 0.15 | 0.94 | 0.34 | 0.143 | 0.63 |
| $K_1Mg_2$ | 2.21 | 0.15 | 0.88 | 0.41 | 0.177 | 0.52 |
| $K_1Mg_3$ | 2.32 | 0.15 | 0.84 | 0.43 | 0.193 | 0.52 |
| $K_2Mg_1$ | 2.37 | 0.16 | 1.26 | 0.35 | 0.113 | 0.81 |
| $K_2Mg_2$ | 2.35 | 0.16 | 1.08 | 0.39 | 0.143 | 0.71 |
| $K_2Mg_3$ | 2.33 | 0.16 | 1.13 | 0.39 | 0.150 | 0.63 |
| $K_3Mg_1$ | 2.17 | 0.14 | 1.28 | 0.34 | 0.147 | 0.73 |
| $K_3Mg_2$ | 2.44 | 0.16 | 1.31 | 0.36 | 0.117 | 0.71 |
| $K_3Mg_3$ | 2.36 | 0.16 | 1.37 | 0.36 | 0.133 | 0.77 |
| Sig. level K l | — | — | *** | — | *** | *** |
| K q | — | — | — | — | * | * |
| Mg l | — | — | — | * | * | * |
| Mg q | — | — | — | — | — | — |
| K x Mg | — | — | — | — | — | — |
| CV% | 5.10 | 4.93 | 11.57 | 10.87 | 12.55 | 10.29 |

* P = 0.05; ** P = 0.01; ***P = 0.001

l = linear response

q = quadratic response

As expected, application of K increased leaf K linearly but decreased leaf Mg. The response was similar to that observed in the experiment at Heemmeliyagara Estate.

Increased rates of Mg caused increases in the concentrations of Ca and Mg and a decrease in Cl. This, however, was not observed at Heemmeliyagara Estate.

A significant interaction for K, Mg at P 0. =05 was also shown and this needs further investigation.

Increase rates of K also significantly (P = 0.001) increased the concentration of Cl.

**Nut Water Analysis**

Increased rates of K caused changes in the concentration of Na, K and Cl in the nut water (Table 7).

**Sodium** With increased levels of applied K, Na showed a quadratic response in the nut water, a sharpe drop at the first level and a reduced drop at the next level.

**Potassium :** Unlike at Heemmeliyagara Estate, K showed a highly significant ( P = 0.001) quadratic response to increased rates of K, an increasing - decreasing pattern. This is difficult to understand. Future studies should clarify the position.

**Chlorine :** For the increased levels of K, the concentration of Cl in the nut water showed a quadratic response, an increase for the initial dosage and thereafter a decline.

The nut water analysis carried out in the two experiments is of a preliminary nature. They indicate general trends in the changes of nutrient concentration for different levels of K and Mg. The work is being continued, together with leaf analysis, to study its role in interpretation of results.

The third fertilizer application was done in May.

*M. Jeganathan and S. Periyathamby, D. M. D. J Wijebandara*
*A. A. Fernando*

## PROJECT 24—STUDIES ON IRRIGATION OF COCONUT

**Experiment 24.2—The effect of frequency and rate of drip irrigation on the soil-plant-water relations and the productivity of coconut. Marandawila Farm, Marandawila (1987) [Dry Zone].**

Objectives of the experiment are (1) to find the "optimum" rate and frequency of drip irrigation and (2) to estimate the crop water requirement and soil moisture extraction pattern of coconut.

A gravity flow type drip irrigation system has been installed by the National Livestock Development Board at Marandawila Farm. An area of about 4 ha with 610 coconut palms of about 30-40 years age are irrigated. The area is intercropped with pasture. The soil is a sandy loam at the surface grading to gravel at depths (below 0.5 - 1.0 m).

The drip system is also capable of supplying fertilizer and details of the pipe lines are given in Fig. 1.

The different frequencies of drip irrigation are as follows :

$T_1$ — Control (no irrigation)
$T_2$ — Irrigate when Soil Water Potential (soil) is below — 10 bar
$T_3$ — ,, ,, ,, ,, ,, ,, ,, — 5 bar
$T_4$ — ,, ,, ,, ,, ,, ,, ,, — 1 bar (always moist)

The soil water potential (soil) is monitored at 1.0 away from the palm at 0.5 m depth using a Neutron Probe.

The experiment is a randomized block design with five replicates.

Twenty plots were selected for the four differential irrigation treatments, with 4 palms per plot, and a single guard row. Fourteen palms were selected among the experimental palms for a comprehensive study on soil moisture extraction pattern using a Neutron Probe (2-3 replicate palms/treatment). One hundred and ninety six aluminium access tubes, 2 m long, were installed at the rate of 14 tubes/palm in July - September.

Soil samples were collected from the same sites at 20 cm depth intervals upto 2 m for soil physical/chemical/root measurements. Yield recording and slashing of over grown grass were done regularly.

Differential irrigation treatments will be introduced in early 1988.

*K. S. Jayasekera and L. P. Vindhana Arachchi*

**Experiment 24.3— Effect of size of the irrigation zone on the growth and water relations of coconut seedlings and its nutrient balance. Bandirippuwa Estate, Lunuwila (1987).**

Objectives of the experiment are (1) to evaluate the size of the "optimum" root zone in relation to water in a surface irrigation system, where water infiiltrates from the soil surface and (2) to study the nutrient distribution (leaching), nutrient balance, water use, and plant growth under different irrigation regimes.

Twelve large cement pots (1.5 m diameter, 1.3 m height) and six pits (same dimensions) were filled with sandy loam soil. Coconut seedlings (var CRIC 60) were planted singly in May. Seedlings are being watered regularly to establish the root system, before introducing the following irrigation treatments in 1988.

$T_1$ irrigate to moist the entire 1.2 m depth of soil (control)
$T_2$ ,, ,, top 0.75 m ,, ,,
$T_3$ ,, ,, ,, 0.5 m ,, ,,
$T_4$ ,, ,, ,, 0.25 m ,, ,,
$T_5$ no irrigation (rainfed only)

Frequency of irrigation will be when the soil water potential is reduced below - 5 bar, at 0.75 m away from the palm at the mid point of the specified treatment depths of the moist soil.

Seedlings in the $T_1$, $T_2$, $T_3$ and $T_4$ treatments will be suitably covered to prevent rain falling on the pots.

At the end of the year, all 18 seedlings were well established, with 5-6 leaves.

*K. S. Jayasekera and L. L. W. Somasiri*

## 5. THE ANALYTICAL CHEMISTRY LABORATORY

**Chemical Analysis :**

**Soil Analysis**

Seven hundred and twenty five soil samples were analysed for pH, conductivity and Exchangeable Bases Na, K, Ca and Mg, 276 for Available P and water soluble CI and 84 for Available S and organic matter.

**Leaf Analysis**

Seven hundred and three samples were analysed for Total N and K; 616 for P Ca and Mg; and 100 for S.

Trace Element determinations were done on Advisory Samples for Fe, Mn, Cu, Zn, B and Cl. Eighty one samples were analysed for Rb.

**Fertilizer Analysis**

Thirty (30) fertilizer samples (organic/inorganic) were analysed for quality standards.

The output in analysis decreased considerably due to

(*a*) The laboratory being shut down for rewiring from May to August and

(*b*) the shortage of staff who also undertake field sampling.

The laboratory continued to participate in the Leaf Sample Exchange Programme (LSEP) conducted under the direction of the University of Wageningen in the Netherlands.

The methods adopted and results of analysis have been reported to be favourable with other institutions.

*G. D. George, T. W. Fernando, S. Periyathamby, N. H. R. M. de Silva, D. M. D. L. Wijebandara, S. M. Ratnayake and G. S. Amarasekera*

**Soil Physical Analysis**

Soil samples were analysed for bulk density (490 samples), particle density (450), field capacity (548), and moisture characteristic curve (188). Total of 105 infiltration rates, 1210 measurements of root samples and 300 samples of weed growth from the ongoing experiment 1.5

*L. P. Vidhana Arachchi, U. S. S. Perera and D. P. Panditharatne*

## 6. ELECTRONIC INSTRUMENT WORKSHOP

During the year, installation, servicing, and repair of some equipment were effected.

Log books and files were opened for the new items of laboratory equipment purchased, and a register for entries on repairs, maintenance and installation.

*N. P. Gunaratne*

# REPORT OF THE CROP PROTECTION DIVISION—1987

**Head—P. Kanagaratnam, Ph.D.**

## 1. GENERAL

### 1.1 Collaborative Research Project

The first phase of the collaborative project which commenced in August, 1985, on "Integrated and Biological Control of the coconut caterpillar, *Opisina arenosella* in Sri Lanka" between CRI and the Silwood Centre for Pest Management (SCPM) together with the Overseas Development and Natural Resources Institute, ODNRI (=TDRI), London and sponsored by the Commission of European Communities was concluded in December 1987.

The main objectives of the project were to understand the population dynamics of the coconut caterpillar and to evolve an intergrated pest management programme.

The staff who collaborated in the project include, Dr. P. Kanagaratnam and Dr. P A. C. R. Perera from the CRI, Professor M. J. Way, Professor M. P. Hassell, Mr. M. E Cammell, Dr. C. Godfray, Dr. J. D. Mumford and Dr. G. A. Norton from the SCPM, Dr. M. Cock from the CAB—International Institute of Biological Control, Dr. D. R. Hall and Mr. Peter S. Beevor from the ODNRI.

### 1.2 Staff matters

**Death:** Mr. V. Shivanantharajah, Experimental Officer, Parasite Breeding Station, Mylambawely, Chenkalady died on 24 February.

**Promotion:** Dr. P. Kanagaratnam was promoted as Senior Research Officer with effect from 6 September, 1985.

**Transfer:** Miss P. K. K. Croos, Technical Assistant was transferred to Plant Physiology Unit with effect from 1 February.

Mr. J. L. J. G. Pinto, Senior Technical Assistant was transferred to the Information Services Unit on 1 June.

Mrs. Indrani Alvitigala, Technical Assistant was transferred to the Coconut Development Authority with effect from 17 June.

**Resignations:** Mr. J. K. F. Kirthisinghe, Senior Technical Assistant resigned his post with effect from 18 January.

Mr. M. S. Velu, Technical Assistant resigned with effect from 2 November.

### 1.3 Awards:

Dr. P. A. C. R. Perera, Messrs. S. M. P. Subasinghe, J. K. F. Kirthisinghe J. L. J. G. Pinto, M. S. Velu, D. M. Jayakody, Cyril Edmund Appuhamy and M. Ramasamy were awarded "Plaques of appreciation" by the Coconut Research Board, in recognition of completing twenty five years satisfactory service at the Coconut Research Institute, Sri Lanka on 2 March.

### 1.4 Academic achievements:

Dr. P. A. C. R. Perera obtained his Ph. D. degree from the Imperial College of Science and Technology, University of London, on successful completion of the thesis on "Studies on *Opisina arenosella* Walker and its natural enemies in Sri Lanka"

### 1.5 Trainees:

Miss P. N. R. Gunewardene, Mr. E. M. A. Edrisinghe, Miss L. Hewage, Miss K. R. Herath, Mr. T. N. S. Koralagama, Mr. U. P. Rajapakse and Mr. D. M. B. Ananda underwent training in the division as part of the programme for the National Diploma in Technology/Agriculture.

The following FAO-Fellows underwent training for the duration specified below;

Mr. Huu Duc Truong—Vietnam—11 May-End August.

Mr. Nisar Kazi—Pakistan—27 August-9 September.

Mr. Mehdi Imam—Pakistan—27 August-2 September.

## 2 RESEARCH PROJECTS

### PROJECT 8—POPULATION DYNAMICS OF THE PEST/PARASITOID COMPLEX OF COCONUT CATERPILLAR.

**Experiment 8.1—The effect of humidity and temperature on population fluctuations of *Opisina arenosella* and its parasitoids (1984).**

The periodically collected population census data on *O. arenosella* and its parasitoids were analysed for correlation with weather factors, using the computer facilities at Imperial College, Silwood Park, England. Detailed analyses were done on the data recorded at,

(1) Dickovita estate, Hendala and
(2) Goluwapokuna estate, Katunayake.

The census data for Dickovita had been recorded at monthly intervals over 10 years and that for Goluwapokuna at weekly intervals over 18 months. The weather factors studied were maximum, minimum and mean temperature, humidity and monthly rainfall.

The analysis of the Dickovita data showed a significant ($P \leq 0.05$) positive correlation of both *O. arenosella* and parasitoid populations with mean minimum temperature. All other correlations were not significant. Similar results were obtained from the analyses of data from Goluwapokuna estate.

Laboratory studies on the effect of temperature on egg laying and egg hatch in the parasitoid *Eriborus trochanteratus* (Hym: Ichneumonidae) indicated that 0,65,85 and 40% at temperatures 15,25,30 and 35°C respectively.

The results of field laboratory studies show that minimum temperatures below a critical value (lying between 15° and 25°C) adversely affect the major parasitoids *E trochanteratus* and *Brachymeria nephantidis* (Hym. Chalcididae) and therefore indirectly favour pest resurgence.

The analysis of field data also showed that pest outbreaks were negatively correlated with parasitoid numbers and associated with temperature and rainfall.

Life table and key factor analysis of the data from Goluwapokuna, estate, Katunayake showed that the egg stage was the key mortality stage and predation by the ant *Monomorium floricola* (Hym: Formicidae) could be a major component.

Inferences drawn from the analysis indicated that the release of laboratory reared parasitoids after an outbreak had developed had little or no impact on control or arrest of damage.

*P. A. C. R. Perera, K. F. G. Perera, K. A. S. Chandrasiri*

**Experiment 8.2.1—The effect of nutrient status of plant on susceptibility to Opisina arenosella attack (1984)**

The experiment using potted coconut seedlings (Annual Report, 1984) was completed.

The seedlings were grown under standard sand culture conditions, using polythene lined cement pots, watered daily and 200 ml of the respective nutrient solution added to each treatment once every seven days. The seedlings maintained on nutrient solutions for 12 months were then bioassayed for development and survival of third instar *O. arenosella* larvae.

The results showed that on potassium deficient (-K) plants, *O. arenosella* larvae consumed significantly ($P < .05$) more leaf area, and lived significantly ($P < .05$) longer than larvae feeding on fully nourished (+All) plants. Significant differences in feeding and survival were not shown by larvae feeding on plants deficient in the other major nutrients or the micronutrients as a group.

The results indicate that potassium deficiency could predispose a coconut palm to *O. arenosella* attack. These investigations are being continued.

*P. A. C. R. Perera, K. F. G. Perera & K. A. S. Chandrasiri*

**Experiment 8.2.2—Host plant relations of the coconut caterpillar (1986).**

The investigations were diverted to examine the possible influence of primary nutrients such as N,P and K and secondary compounds such as amino acid on the outbreaks of *O. arenosella*.

Leaf samples collected from infested (susceptible) and uninfested (apparently resistant) palms during an outbreak of *O. arenosella* showed that the infested palms had a significantly ($P < 0.05$) lower foliar potassium ($0.59\% \pm 0.03$) when compared with the apparently resistant palms ($0.87\% \pm 0.29$).

The studies conducted by the SCPM staff in collaboration with the CRIs taff using leaf cages confirmed the above observations and also showed that the growth rate of first instar *O. arenosella* larvae on older leaves (leaf 11) was much faster than on the younger leaves (leaf 2). In general, these investigations showed that larvae of *O. arenosella* preferred the more mature leaf (leaf 11), where it had a faster development rate and a lower mortality rate than on young leaf (leaf 2).

Studies at Godawanahena, Tangalle on the distribution of potassium in leaves of different ages in a palm showed that the younger leaves had a much higher potassium content when compared with that in more mature leaves, with 1.1% for leaf No. 5 and 0.63% for leaf No. 14.

Chemical analysis of leaf samples collected in March/April 1986 from heavily infested palms from Horakelle showed that the potassium content in infested palms was considerably less than in uninfested palms, the difference increasing with leaf age. Similar results were also obtained for the total amino acid content which was less in the infested palms.

However, analysis of leaf samples randomly collected from areas with a previous outbreak history, but currently unattacked, when compared with samples from areas where *O. arenosella* infestations were not known, showed no significant differences in potash content.

These studies demonstrate a correlation between the occurrence of *O. arenosella* and the potassium levels in the leaf and confirm the previous results on natural infestation patterns where maximum representation of the pest was found to be in the leaf No. 12—16 range, with very few pest numbers in the younger leaves having the higher potassium content.

*P. A. C. R. Perera, M. E. Cammell & M. J. Way.*

**Experiment 8.3: The introduction of Antrocephalus pandens (Hym; Chalcididae) (1984).**

In further attempts to establish *A. pandens* as a possible pupal parasitoid of *O. arenosella*, rearing and release of *A. pandens* were continued throughout the year. No recoveries of *A. pandens* were recorded from any of the release sites. The experiment was discontinued and the rearing of *A. pandens* was terminated.

*P. A. C. R. Perera, M. S. Velu, K. F. G. Perera & K. A. S. Chandrasiri.*

**Experiment 8.5: The functional responses of the important parasitoids of *O. arenosella* (1984.)**

Results of the field studies (Annual Report, 1986) carried out at Palaicholai estate, Madurankuliya indicated that of the larval parasitoids *Goniozus nephantidis* and *Eriborus trochanteratus* which were actively present in the field at the time of the experiment, *G. nephantidis* was seen to search only at veryhigh host densities, and *E. trochanteratus* showed an increase in mean parasitism with increase in host density.

An experiment was also carried out in field cages (2x2x2m) using seven treatments corresponding to host densities of 5, 10, 20, 40, 80, 120, and 160 per cage and replicated five times.

A measurable functional response was recorded only for the larval parasitoid *E. trochanteratus* under the experimental conditions. Mean parasitism by *E. trochanteratus* increased progressively with increase in host density up to a maximum of 80 larvae when mean parasitism was 22.31+1.66 larvae, but decreased thereafter.

*P. A. C. R. Perera, K. F. G. Perera & K. A. S.* Chandrasiri.

**Experiment 8.6: Use of pheromones in the control of *O. arenosella* (1985).**

This collaborative research programme between the CRI and the Overseas Development and Natural Resources Institute. ODNRI, London (=Tropical Development and Research Institute, TDRI) was continued.

The female sex pheromones of *O. arenosella* were isolated, identified and synthesised at the ODNRI, U.K.

Although the initial laboratory studies were encouraging, the subsequent field studies showed no significant ($P < 0.05$) difference between blank traps and the phero mone—loaded traps.

All attempts to develop a satisfactory pheromone for field use failed and this aspect of the collaborative project was therefore concluded.

*P. A. C R. Perera, J. D. Mumford, D. R. Hall & Peter S. Beevor.*

## PROJECT 9: EVALUATION OF SYSTEMIC INSECTICIDES FOR THE CONTROL OF FOLIAR PESTS OF COCONUT

**Experiment 9.1.9: Field evaluation of systemic insecticides against *Opisina arenosella* (1986).**

Large scale field evaluation was continued this year too. About 7000 palms heavily infested with the coconut caterpillar in several estates at Kurunegala, Madampe, Anuradhapura and Ambalantota were treated by trunk injection, using electric drills, with 60% monocrotophos at the rate of 6 ml per palm. The insecticide was applied in undiluted form into the holes drilled in the trunks at the rate of one hole per palm.

The catepillar infestations in all the treated plantations were brought under satisfactory control by this treatment. The treated palms did not show any adverse effect due to the insecticide application in the undiluted form.

*P. Kanagaratnam, L. C. P. Fernando and D. M. Jayakody.*

**Experiment 9.1.10: Detection of pesticide residues in kernel and nut water from palms treated with systemic insecticides, by bioassay using *Drosophila* sp. (1987).**

The objective of this study was to determine whether the systemic insecticides reach kernel and nut water from the injection hole in the trunk, by bioassay using the fruit fly, *Drosophila* sp.

Two preliminary trials were carried out by injecting into the trunk of palms, 56% monocrotophos (Nuvacron) at the rate 20 ml per palm at different dates. Untreated palms were used as control.

In the first trial, samples of nut water and kernel from young developing fruits and mature fruits were collected from one palm, 13 days after treatment with the insecticide and for the second trial these samples were collected from one palm 18 days after treatment. These samples were fed to the insects in test tubes. For control, samples were collected from untreated palms.

In the first trial, the samples were in two replicates with five adults per replicate in the second trial, there were five replicates with thirty adults per replicate.

Cotton wool was soaked in nut water from tender and mature nuts and in the milk extracted from the kernel and fed to the insects. Kernel was scraped and fed.

Observations on the mortality of insects were recorded two days after feeding. Results are given in Table 1.

The mortality of adults in control and treated samples was very low and similar, indicating that the level of insecticide in the edible parts was very low.

*P. Kanagaratnam and L. C· P. Fernando.*

**Table 1*** *Mortality of adults of Drosophila sp. when fed with edible parts of coconut from palms treated with monocrotophos.* (*Experiment* 9.1.10)

| | *Percent mortality two days after feeding* | | | |
|---|---|---|---|---|
| | *Trial* 1 | | *Trial* 2 | |
| *Treatment* | *Control* | *Treated* | *Control* | *Treated* |
| Nut water from tender nut ... | 0 | 0 | 0 | 0 |
| Nut water from mature nut ... | 0 | 0 | 3.3 | 5.0 |
| Kernel from tender nut ... | 0 | 0 | 5.0 | 6.7 |
| Kernel from mature nut ... | 0 | 0 | 8.3 | 1.6 |
| Milk from mature nut ... | 0 | 10 | 1.6 | 8.3 |

Note: For Trial 1, samples were collected 13 days after treatment with the insecticide and for Trial 2, 18 days after treatment.

**Experiment 9.1.11: Studies on pesticide residue analysis by chemical assay of nut water from palms treated with systemic insecticide by trunk injection (1985).**

Initially a bearing palm about 11 years old was selected and treated with 20 ml of 60% monocrotophos by trunk injection. The developing fruits from the treated palm were harvested on days 3 and 7 after insecticide application, the nut water collected and examined by Thin Layer Chromatography (TLC) for detection of residues of the insecticide at the CISIR in Colombo.

While only a trace of residues of monocrotophos was detected on the third day, more monocrotophos was detected on the seventh day. However on both occasions, the levels were well below 0.01 ppm.

The TLC was repeated with nut water collected at weekly intervals upto six weeks after injection of monocrotophos into a different palm, as described earlier. The results indicated that the levels of residues of monocrotophos in the nut water were well within the tolerance limits of 0.02 ppm approved by the FAO/WHO.

However caterpillars of *Opisina arenosella* fed with leaflets collected from the palms treated with the insecticide died due to toxic levels present in the leaves.

The TLC analysis was repeated, using nut water collected from developing nuts at different stages of maturity from the same palm. Samples from three treated palms, each of which was injected with 20 ml of 60% monocrotophos per palm, were analysed. The results are given in Table 2.

Further analysis using TLC was carried out on nut water from some mature bunches harvested from three palms treated with 20 ml of 60% monocrotophos per palm by trunk injection. The results are given in Table 3.

The results indicate that in all except one sample the residue level of monocrotophos was below the tolerance limit set by the WHO/FAO.

The variation in the residue levels observed within a bunch as well as between bunches may be due to factors such as the position of the bunches in relation to the injection hole. Experimental errors especially at low levels of detection, also would have contributed to this.

The TLC screening was found to be inadequate to study the insecticide levels in coconut kernel (endosperm).

More accurate analysis using techniques such as Gas-Liquid Chromatography should be carried out before firm conclusions on residues could be arrived at.

*P. Kanagaratnam, A. M. Mubarak, H. P. G. Gunewardene and W. P. K. K. Croos*

**Experiment 9.2.1: Evaluation of systemic insecticides for the control of *Oryctes rhyinoceros* in coconut seedlings and young palms (1984).**

The experiments at Kohombe estate 1 A and at Bandirippuwa estate were continued. The insecticides were applied once every two months and the damage assessment was made at each application. The results are being analysed. It appeared that the insecticide application was not effective in preventing damage to the fronds in young palms.

*P. Kanagaratnam and L. C. P. Fernando.*

**Table 2** *Levels of residues of monocrotophos in coconut water in fruits of different stages of maturity on treated palms.* (*Experiment* 9.1.11)

| *Palm No.* | *Date of injection* | *Analysis samples (days after injection)* | *Fruit bunch number* 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 March | 7 | Trace | Trace | Trace | Trace | — | — | — | — |
| | | 21 | — | — | Trace | — | — | — | — | — |
| | | 28 | — | Trace | Trace | Trace | — | — | — | — |
| | | 35 | no sample | Trace | no sample | — | — | — | — | — |
| | | 42 | no sample | — | — | no sample | — | — | — | — |
| 2 | 13 May | 7 | — | — | — | — | — | — | — | — |
| | | 21 | — | — | — | — | — | — | — | — |
| | | 35 | — | — | — | — | — | — | — | — |

Trace : About 0.02 ppm monocrotophos in coconut water
— : Below 0.02 ppm monocrotophos in coconut water
Note : Bunch No. 1 is the youngest and 8, the oldest. All the fruits in these bunches were large enough so that about 250 ml water per fruit could be collected for analysis.

**Table 3** *Levels of monocrotophos in nut water collected from fruits of medium maturity in treated palms* (*Experiment* 9.1.11)

| *Palm No.* | *Bunch No.* | *Days after treatment with insecticides* 5 | 12 | 19 | 26 | 32 | 39 | 53 |
|---|---|---|---|---|---|---|---|---|
| 1 | 5 | +++ | ++ | +++ | Not detected | Not detected | ++ | + |
| 2 | 6 | no sample | ++ | +++ | + | + | ++ | + |
| 3 | 6 | 0.03 ppm | +++ | ++ | ++ | + | +++ | + |

+++ : About 0.02 ppm monocrotophos in coconut water
++ and : Below 0.02 ppm monocrotophos in coconut water.

## PROJECT 11. BIOLOGICAL CONTROL OF BLACK BEETLE.

**Experiment 11.1.4: Effect of temperature on the growth of different strains Metarhizium anisopliae (1986).**

Growth of ten strains of *Metarhizium anisopliae* was evaluated at three different temperatures, viz. 27.5°C, 30°C and 32.5°C. The ten strains were 148—83, 19—79, 100—83, 189—83, 137—82, 171—83, 170—83, 172—82, 208—83 and the local strain. The first nine strains were obtained from Dr. Andrian Gillespie at the Institute of Horticultural Research, (=GCRI), Littlehampton, West Sussex, England.

In all the strains, maximum growth occured at 30 °C. At 32.5 °C the growth was extremely low. At 27.5 °C the growth was fairly high. The growth rate varied among the strains tested. The results are being analysed.

*L. C. P. Fernando and P. Kanagaratnam.*

**Experiment 11.1.7: Studies on the dissemination of *Metarhizium anisopliae* at Bandirippuwa estate (1986).**

The experiment was continued from last year. Under field conditions, when the black beetle medium in the boxes was kept moist by watering, the larvae were killed by the fungus and sporulation was observed on dead larvae.

Adult beetles were attracted to the impregnation boxes and eggs were observed when the media were examined. The larvase were killed by fungus infection, even in the untreated boxes, which were about 10 m away from the treated boxes. As the coconut logs used to make the impregnation boxes perished, the experiment was repeated with new impregnation boxes and pits.

There were 12 impregnation boxes and 12 impregnation pits which were 5m apart. The dimensions of the pits were 1m x 1m x 0.5m. The boxes were made using 2 tiers of 1m, long coconut logs. The pits and rows were in four rows; there were two rows of pits six in each. The boxes were also arranged similarly. These were filled with a mixture of fibre dust and goat dung.

In May, third instar larvae inoculated with fungal spores were released initially at the rate of 45 larvae per pit/box into six pits and six boxes which were randomly selected.

Later 10 larvae inoculated with the fungus were released after each observation on days 20, 46 and 75 after initial release. For the control, equal numbers of healthy larvae as for the treated pits boxes were released into 6 pits and 6 boxes.

The pits/boxes were kept moist by watering and covered with coconut fronds. Observations on healthy and infected larvae and for the presence of adults and eggs were taken. The results are given in Table 4.

The results indicate that at 20 days after initial release of inoculated larvae, control pits and boxes were free from fungus infected larvae. However the fungus infected larvae were found in the control boxes and pits at 46 and 75 days after initial release.

The Baculovirus infection has interfered and many larvae died due to this infection in the control and treated pits and boxes. Thus firm conclusions cannot be arrived at the degree of dissemination of the fungus. It was interesting to note that adults and eggs of black beetle were found in the media indicating that the adults were attracted to the artificially made boxes.

*L. C. P. Fernando and P. Kanagaratnam*

**Table 4**—*Natural dissemination of Metarhizium anisopliae among black beetle population at Bandirippuwa estate.*
(*Experiment* 11.1.7)

| *Treatment* | *Total number of healthy and infected insects at different durations.* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 20 *days* | | | 46 *days* | | | 75 *days* | | |
| | *Healthy* | *F* | *V* | *Healthy* | *F* | *V* | *Healthy* | *F* | *V* |
| Control ... | 185L,2A1P | nil | 64 | 90L,,1A | 8 | 31 | 39L | 17 | 4 |
| (Pits + boxes) ... | | | | | | | | | |
| Treated ... | | | | | | | | | |
| (pits + boxes) ... | 46L,2A | 44 | 125 | 21L,22E | 33 | 33 | 25L | 10 | 13 |

L—larvae, A—Adults, P—Pupae, E—Eggs,
F—Fungus infected larvae V—Virus infected larvae.

**Experiment 11.1.8—Effect of releasing *Metarhizium anisopliae* and *Baculovirus* of *Oryctes* into the impregnation pits, (infection foci) on the population of black beetle. (1987)**

The aim was to establish the two pathogens among the black beetle population in an estate severely infested with black beetle so that the pest will be kept under control by the pathogens. The experiment was started at Kohombe estate 1 B at Kakkapalliya in July.

Two hundred impregnation pits were prepared at the rate of one pit for every fifty palms. The dimensions of the pits were 1 m x 0.5m. The pits were filled with a mixture of coir dust and cowdung. Black bettle larvae infected with *Baculovirus of Oryctes* were released into 150 pits and larvae inoculated with spores of *Metarhizium anisopliae* cultured on maize grains by mixing the larvae and maize in a container were released into 50 pits. The releases were made from July until the end of September. Initally, before the end of August a minimum of either ten virus infected larvae or ten fungus inoculated larvae were released into each pit. Thereafter the treated larvae were released frequently according to availability. When larvae were not available in adequate numbers, the fungus spores (obtained from cultures on maize grains) were inoculated into the 50 pits reserved for fungus releases and mixed with the medium. When the medium dried, water was applied to the pits.

**Table 5**—*Establishment of Metarhizium anisopliae and Baculovirus of Oryctes among black bettle population in impregnation pits at Kakkapalliya*
[*Experiment* 11.1.8]

| *Date observed* | *Total no. of pits boxes examined* | *Total no. of live beetle stages* | | | | *Total no of dead larvae due to virus/fungus* | |
|---|---|---|---|---|---|---|---|
| | | *A,* | *E,* | *L,* | *P* | *Virus* | *Fungus* |
| 14.8.87 ... | 42 | 11, | 210, | 342, | 0 | 39 | 16 |
| 21.08.87 ... | 33 | 0, | 3, | 88, | 0 | 5 | 12 |
| 25.09.87 ... | 23 | 1, | 0, | 293, | 0 | 12 | 38 |
| 30.09.87 ... | 19 | 4, | 0, | 739, | 0 | 46 | 210 |
| 20.10.87 ... | *107 | 6, | 6, | 232, | 0 | 66 | 82 |
| Total ... | | 22, | 219, | 1694, | 0 | 168 | 358 |

A—Adult beetles, E—Eggs, L—Larvae, P—Pupae

* 65 pits were submerged in floods.

Later, several observations were taken to assess the establishment of pathogens among the black bettle larvae in the pits.

In the pits there were adult beetles, eggs and newly hatched larvae indicating that the beetles were attracted to the treated pits. The degree of disease incidence among the larvae in the pits is given in Table 5. The results indicate that the pathogens have established among the black beetle population in the pits. However due to heavy rain during September and October there was standing water in most of the impregnation pits where the black beetle larvae were drowned. The pits were either flooded or too wet for black beetle development until the end of the year. Therefore it is necessary to conduct further field studies on the establishment and dissemination of the two pathogens.

*P. Kanagaratnam and L. C. P. Fernando.*

## PROJECT 17: STUDIES ON PREMATURE DECLINE OF PALMS

### Experiment 17.3: Studies on presence of Mycoplasma like Organisms (MLO) in tissues of coconut palms showing tapering trunk and Leaf Scorch Decline.

Preliminary screening to detect the presence of MLO in vascular tissues of palms affected by tapering and Leaf Scorch Decline, was done using the DNA fluorescent stain DAPI at the Institute of Horticultural Research (IHR) Kent, England.

From both healthy and affected palms, samples of vascular tissue were collected thrice from roots, unopened inflorescence by splitting the spathe and from the midrib of the spear leaf (youngest) and preserved in 2% glutaraldehyde in 0.1 M phosphate buffer PH 7. From these samples 15-20 um thick sections were cut using a freezing microtome and examined after staining the sections using DAPI-stain, under a fluorescence microscope at the IHR in England.

This examination did not reveal any of MLO in the tissues. A few fluorescing objects in one or two sections were seen but they were also seen in sections from the healthy tissue. However they were not typical of the MLO which were observed from other diseased specimens.

*P. Kanagaratnam and M. F. Clark*

## PROJECT 21: BIOLOGY, BEHAVIOUR AND CONTROL OF RED WEEVIL

### Experiment 21.1.2: Evaluation of the suitability of cut coconut petioles and sugarcane stem cuttings as food and egg laying media for red weevil (1987).

The objective of this experiment was to find out a suitable medium for egg laying as well as food for mass rearing of red palm weevil.

Treatments used in this experiment were coconut petioles and sugarcane stem pieces. Each treatment was replicated 20 times. A pair of newly emerged adult weevils was caged separately with each medium. Then the number of eggs laid and the number of larvae hatched out were recorded daily. Longevity of the weevils too was recorded.

High egg laying and fertility were recorded in the adults fed with sugarcane. Life span of the weevils was longer in the adults reared on sugarcane stem pieces (Table 6) than on cut coconut petioles.

*C. N. K. Rajapakse and P. Kanagaratnam*

**Table 6**—*Egg Production, Hatchability of Eggs and Life Span of Red Weevil when Reared on Sugar Cane and Cut Coconut Petioles.*
(*Experiment* 21.1.2)

| *Rearing medium* | *Average egg Production per female* | *Hatchability (Percent)* | *Longevity* | |
|---|---|---|---|---|
| | | | *Female* | *Male* |
| Coconut petiole ... | 153 | 73 | 58 | 76 |
| Sugar cane stem cutting... | 252 | 67 | 75 | 90 |

### Experiment 21.3: Laboratory Studies on Reproductive Biology of the Red Weevil (1985)

The procedures and the designs of the experiment 21.3.1 and 21.3.2 were described in the report for 1986.

**Experiment 21.3.1—Effect of mating of different number of males with a single female on reproductive cycle when males and females were not separated (1986).**

Observations on the reproductive biology of the red palm weevil were completed and the results were analysed. The results are given in Table 7.

In addition to this, the natural sex ratio of this insect was also determined by caging individually 500 live pupae until the emergence of adults.

The average number of eggs laid per female as well as the average number of eggs hatched decreased with the increase in the number of males caged together with a single female. The life span of the female was longer when the female: male ratios were 1.1 and 1.8, but was much less when the ratios were 1.2 and 1.4. It appears that the life span of females was not dependant on the number of males present.

The egg laying pattern in all the ratios was similar. The highest egg production was recorded during the first ten days in all the combinations. Thereafter, the egg production graudally decreased.

**Table 7**—*Oviposition, Hatchability of Eggs and Longevity Red Weevils Confined To Cages in Various Sex Ratios.*
(*Experiment* 21.3)

| *Female: Male* | *Average No. of eggs laid/female* | *Average No. of eggs hatched* | *Longevity of females (days)* |
|---|---|---|---|
| 1 : 1 | 318 | 219 | 93 |
| 1 : 2 | 231 | 152 | 73 |
| 1 : 4 | 202 | 137 | 82 |
| 1 : 8 | 163 | 65 | 96 |
| c.v. | 28.93% | 45.24% | 21.97% |
| Significance | *** | ** | ** |
| L.S.D | 74.25 | 67.39 | 19.49 |

**P=0.01
***P=0.001

The average ovipositing period of female in the ratios 1 : 1, 1 : 2 and 1 : 4 was 65 days, but it was only 50 days in the ratio 1 : 8, (Fig. 1).

The rate of decrease of egg production with time was similar in all combinations. Females in all combinations laid about 37% of the total eggs during the first 10 days. (Fig. 2).

The rates of decrease in hatchability with time were similar in all combinations. Percentages of eggs hatched was highest during the first 10 days. (Fig. 3).

In the observations on the natural sex ratio, 312, adults emerged from 500 pupal cocoons. Of these, 154 were female and 158 were males. Thus the natural sex ratio of red weevils appears to be about 1 : 1.

From the above studies it appears that maintenance of the male: female ratio at 1 : 1 is adequate in red weevil mass rearing programmes in the laboratory.

*C. N. K. Rajapakse, P. Kanagaratnam and P. K. K. Croos.*

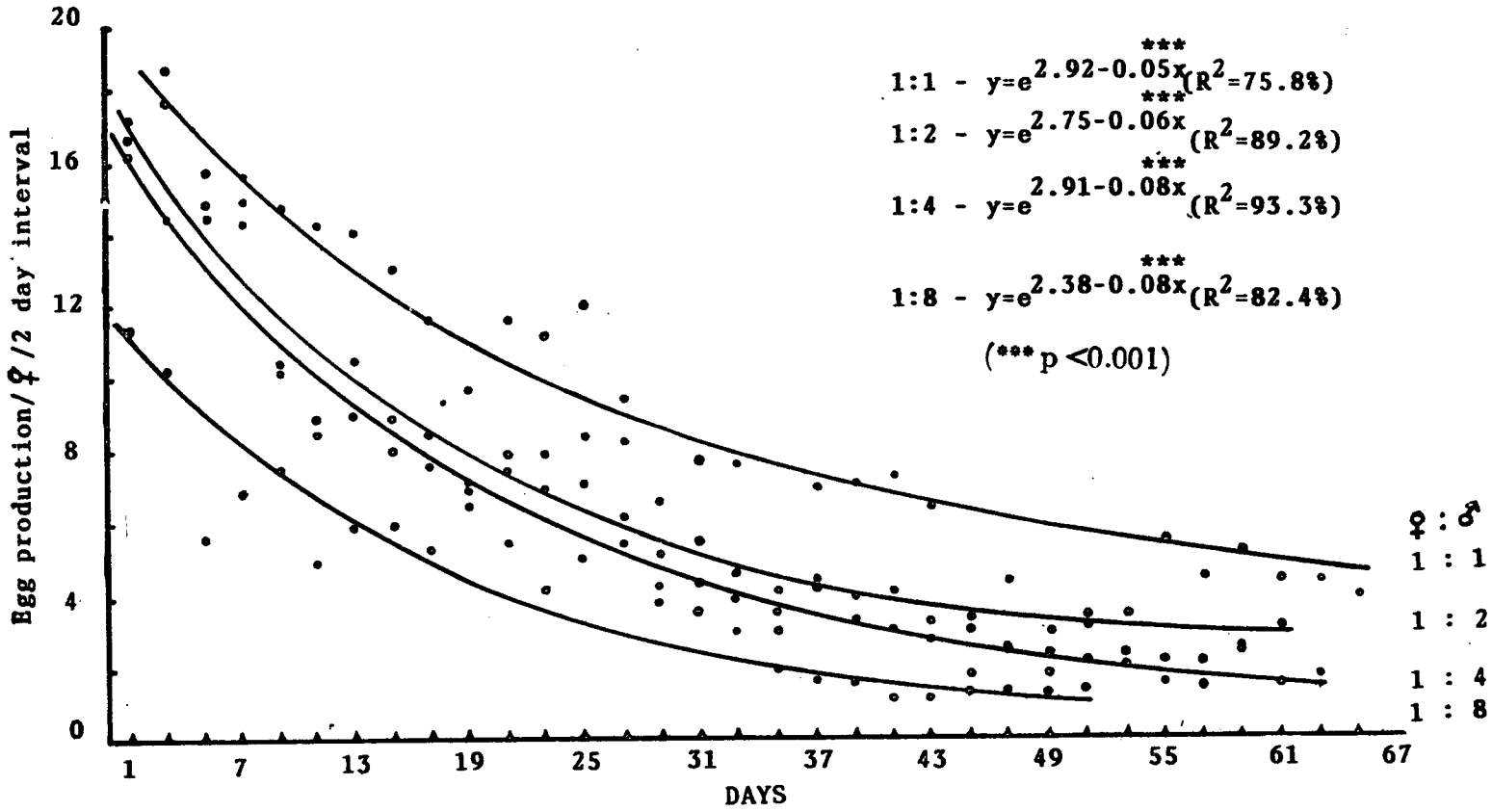


Fig. (1) Mean egg production per ♀ per 2 day interval of Rhynchophorus ferrugineus

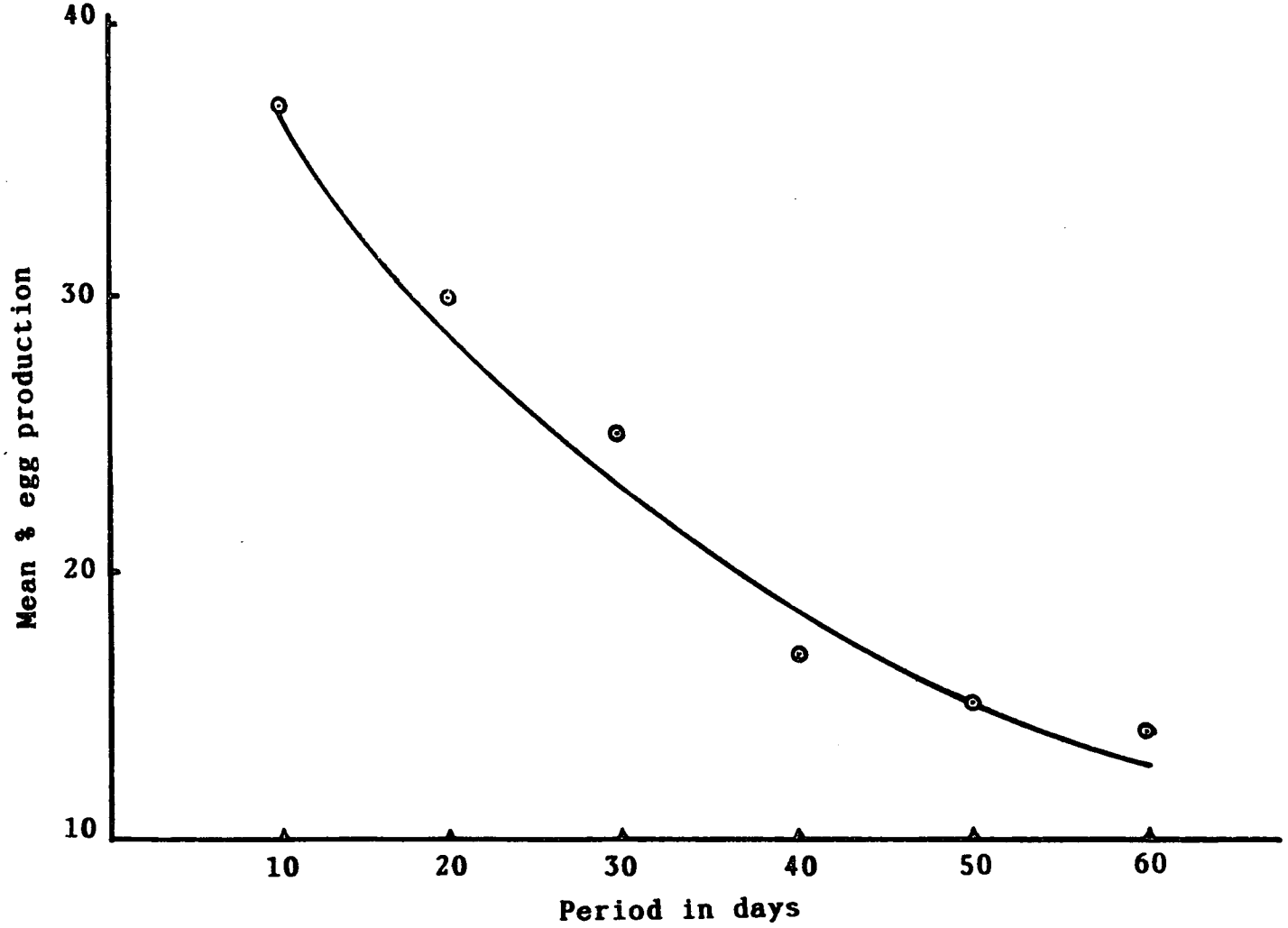


Fig. (2) Mean percentage egg production of Rhynchophorus ferrugineus

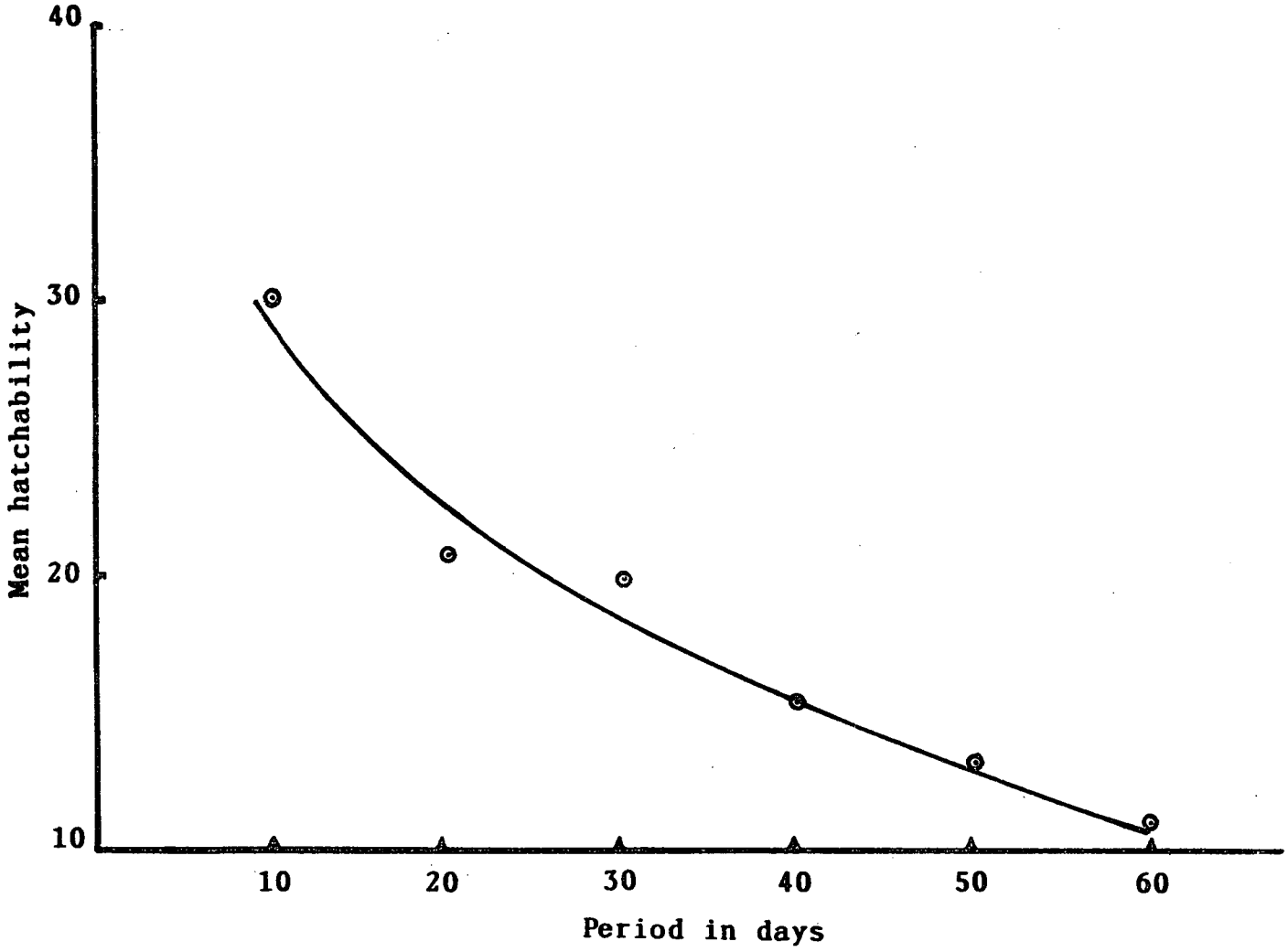


Fig. (3) Mean hatchability of Rhynchophorus ferrugineus

**Experiment 21.3.2: Effect of multiple matings on the fecundity and hatchability of the red weevil when males and females were separated immediately after mating (1985).**

This experiment was completed and the results are given in Table 8. The number of eggs laid by a female and the number of eggs hatched increased with the increase in the number of matings.

The ovipositing period also increased with the increase in the number of matings.

A single mating was sufficient for a female to lay eggs for about 28 days. A female, after mating 15-20 times, laid eggs for a period of about 3 months.

*C. N. K. Rajapakse and P. Kanagaratnam.*

**Experiment 21.4.1: Evaluation of three systemic insecticides and three application methods against red weevil. Kirimetiyana Estate. (1987).**

The objective of this experiment is to determine the effective insecticides and the best method of application in controlling the Red weevil.

The insecticides used in this experiment were 60% monocrotophos, 60% methamidophos and 25% metasystox. The application methods used were trunk injection, feeding through exposed roots and drenching into the crown. The insecticides were applied at the rate of 6 g ai per palm.

Fifty palms of about 10 years old were selected for this experiment, and the experiment was carried out at different times, because of the difficulty in obtaining the required number of larvae of the same size.

**Table 8**—*Oviposition, Hatchability of Eggs and duration of Oviposition with varying numbers of mating.*

| *No. of matings* | *Average no. of eggs laid per female* | *Average no. of eggs hatched* | *Duration of oviposition (days)* |
|---|---|---|---|
| 1 | 57 | 38 | 28 |
| 2 | 123 | 82 | 51 |
| 3 | 139 | 94 | 86 |
| 4 | 145 | 94 | 67 |
| 6 | 180 | 115 | 70 |
| 10 | 176 | 117 | 75 |
| 15 | 180 | 122 | 90 |
| 20 | 183 | 120 | 92 |

Ten palms were infested by the following method at weekly intervals. Holes were made in the upper portion of the trunk using an electric drill and 20 larvae/palm, were introduced into the trunk. The hole was then covered with wire mesh to prevent the escape of larvae.

Two weeks after introduction infested palms were treated with the chosen insecticide, using the different application methods. After 10 days the treated palms were uprooted, cut and split into pieces for examination. The mortality of the larvae was recorded. The results of the experiment are being analysed.

*C. N. K. Rajapakse, P. Kanagaratnam and D. M. Jayakody.*

**Experiment 21.4.2—Persistence of effectiveness of two systemic insecticides against red weevil in coconut palms treated by trunk injection and root feeding (1987).**

**Trunk injection**

The insecticides used together with the methods of application are as described in experiment 21.4.1. Petioles from the treated palms were cut and fed to the larvae at weekly intervals as described below. Ten petiole pieces from each palm (including the control) were used and one larva was introduced into each petiole of about 35 cm in length. Each petiole piece was then covered with a nylon net to prevent the escape of the larva. The larvae used in this experiment were of similar size. The larvae were allowed to feed for one week and then examined for survival by splitting the petiole pieces at weekly intervals. Fresh petiole pieces were cut from the same palm as earlier and offered to the larvae every week.

**Root Feeding**

Three king coconut palms (variety, *Aurantiaca*) were selected. One was treated with 60% monocrotophos, the second was treated with 60% methamidophos by feeding through the exposed roots, at the rate of 6 g ai per palm. The third palm was used as the control palm to which 10 ml of water was fed through roots. One week after the treatments ten red weevil larvae of uniform size were introduced into the trunks of each palm. On the same day from each palm ten petiole pieces 35 cm in length were cut, and fed to healthy red weevil larvae by introducing one larvae into each petiole.

Seven days after feeding, the petioles were split and larvae examined. Observations were continued for three weeks at the end of which the palms in the field were also uprooted, cut and examined for the mortality of the red weevil larvae. Tables 9 and 10 give the mortality of larvae in the petiole pieces. The highest larval mortality was recorded at the end of the first week after treatment. A decrease in the mortality was recorded at the end of 3 weeks after treatment. It could be inferred that the decrease in effectiveness of insecticides in petioles with time was similar, irrespective of the method of application.

Examination of split palms indicated 100% mortality in the monocrotophos treatment, 70% in methamidophos treatment and 20% in the control.

*C. N. K. Rajapakse and P. Kanagaratnam.*

**Table 9**—*Mortality of red weevil larvae when fed with petioles cut from palms at different durations after application of systemic insecticides by trunk injection.*
(*Experiment* 21.4.2)

| *Treatment* | *Percent mortality* | | |
|---|---|---|---|
| | *One week* | *Two weeks* | *Three weeks* |
| Monocrotophos | 100 | 70 | 50 |
| Methamidophos | 80 | 80 | 60 |
| Control | 0 | 0 | 10 |

**Table 10**—*Mortality of red weevil larvae when fed with petioles cut from palms at different durations after treatment with systemic insecticides by root feeding.*
(*Experiment* 21.4.2)

| *Treatment* | *Percent mortality* | | |
|---|---|---|---|
| | *One week* | *Two weeks* | *Three weeks* |
| Monocrotophos | 100 | 80 | 40 |
| Methamidophos | 70 | 80 | 50 |
| Control | 20 | 0 | 0 |

## 3. MISCELLANEOUS

### 3.1—Introduction of the oil palm pollinating weevil, *Elaeidobius kamerunicus* faust, to Sri Lanka.

A nucleus culture of the weevil *Elaeidobius kameranicus* Faust was imported in November, 1986. Laboratory screening, quarantine testing and laboratory breeding commenced in December (Annual Report of the Crop Protection Division, CRI, 1986).

The approval of the Chief Plant Quarantine Officer was received on 31 December, 1986 for the release of the insect at Nakiadeniya Oil Palm Plantation, Nakiadeniya and at other oil palm plantations.

Laboratory breeding of the insect was successfully carried out using male flowers of oil palm collected from the Government Farm, Walpita. The first release of the insect was carried out on 9 January at two locations at Nakiadeniya Oil Palm Plantation. The foci of release were a cluster of 10 palms (about 20 years old) with freshly anthesising flowers at Doonvale division and five palms (about five years old) in similar condition at Mamanadola division. A total of 12,000 insects were released on the flowers. The flowers were then examined *in situ* on 17 January. Both larval and prepupal stages were observed in male flowers, indicating successful establishment. Thereafter, observations were taken at fortnightly intervals and the insect was found to be multiplying and spreading rapidly. In Doonvale division the insect spread rapidly from a central point, colonizing

the entire 150 ha block containing palms of varying ages within 15 weeks, at which time it had spread over a radius of more than 1 km from the release point. At Nakiadeniya Oil Palm Plantation, the insect was collected from initial release areas and distributed in new areas. In late January and early February, the insect was also released at the following estates, all of which had varying extents of 5-year old oil palm blocks:

Walahanduwa SP; Walahanduwa; Igalkanda SP, Elpitiya; Baddegama SP, Baddegama; Citrus SP, Poddala and Nagoda SP, Nagoda.

By the end of June, the insect had established well in all plantations and it had been possible to terminate manual pollination, thus effecting a considerable saving.

Laboratory breeding of the insect was discontinued in April as the insect could be collected in large numbers from all plantations. The insect was also successfully established at an abandoned oil palm block at the Government Farm at Walpita.

*R. Mahindapala, M. S. Velu and D. M. Jayakody.*

**3.2—Introduction of Brachymeria nosatoi and Elasmus nephantidis to Sri Lanka.**

Two hymenopterous parasitoids of *Opisina arenosella* viz. the pupal parasitoid, *Brachymeria nosatoi* Habu, (Chalcididae) (Z. Bouvcek (C.I.E.) det.) and the pre pupal parasitoid, *Elasmus nephantidis* Rohwer, (Elasmidae) (Z. Bouvcek (CIE) det.) were imported to Sri Lanka from the Central Plantation Crops Research Institute, Kayangulam, Kerala, India on 23 August. These parasitoids were reared in the insectary at Lunuwila and released on several occasions at the following estates, when the pest was available in the appropriate stage. The numbers of insects released are given against the names of the estates.

| | | | |
|---|---|---|---|
| *B. nosatoi* | — | Goluwapokuna Estate, Katunayake | — 3700 |
| | | Mahaberiatenne Farm, Digana | 600 |
| | | Delatura, Ja-ela (Small holdings) | 1025 |
| | | Kelaniya (Small holdings) | 1400 |
| | | Kakkawatte, Madampe | 600 |
| *E. nephantidis* | | Goluwapokune Estate, Katunayake | 7350 |
| | | Mahaberiatenne Farm, Digana | 450 |
| | | Delatura, Ja-ela | 1550 |
| | | Miriswatte, Beliatte | 250 |
| | | Udoppuwa (Small holdings) | 1350 |
| | | Kakkawatte, Madampe | 750 |

The two parasitoids readily parasitised *O. arenosella* in the laboratory at Lunuwila. *E. nephantidis* had been introduced into Sri Lanka many years back too. However there was no record of its establishment in the field after the earlier introduction. Therefore it was introduced again in an attempt to establish it in the field.

The observations are in progress.

*P. Kanagaratnam, M. S. Velu and R. G. Caldera.*

**3.3—New record of a serious pest of Ipil Ipil, *Leucaena leucocephala*.**

Ipil Ipil, *Leucaena leucocephala* is an important Leguminous tree crop grown in coconut lands. During the latter part of the year, young vegetative shoots were heavily infested by the pest, *Heteropsylla cubana* Crawford (Psylloidae).

This is a serious pest of Ipil Ipil. Already it has spread rapidly in a large area in Sri Lanka and has caused severe damage to the newly developing vegetative and reproductive shoots. No effective natural enemies were yet observed.

*P. Kanagaratnam and L. V. K. Liyanage.*

**3.4—Studies on insect parasitic nematodes against black beetle and red weevil.**

At our request, the Institute of Horticultural Research (=GCRI), Littlehampton West Sussex screened two insect parasitic nematodes viz. *Steinernema bibionis* and *Heterorhabditis heliothidis* against the coconut pests, *Oryctes rhinoceros* and *Rhynchophorus ferrugineus*.

The larvae of *O. rhinoceros* were buried in a small amount of potting compost that had been inoculated six months earlier with *Steinernema bibionis*. The larvae died within 48 hours and were subsequently found to be highly parasitised.

However, it appeared from the studies carried out that *S. bibionis*, strain T 319 was not a suitable pathogen for use as a control agent against red weevil.

In studies carried out with *H. heliothidis* against red weevil, it was apparent that the nematode was effective against the red weevil.

Further studies on the use of *S. bibionis* against black beetle and *H. heliothidis* against red weevil appear to be justified.

*P. Kanagaratnam, J. C. Hughes and P. N. Richardson.*

**3.5—Record of two hyperparasites of *Opisina arenosella*.**

The hyperparasite, *Pediobius elsmi* (Ashmead), (Eulophidae) (Z. Boucek (CIE) det), was found in a caterpillar infested estates at Ja-ela in the Western Province. This insect can develop as a hyperparasite in lepidopterous hosts, for instance, via *Apantales*.

Another hyperparasite, *Aphanogmus* sp. (Ceraphronidae.) (A. Polaszek (CIE) det.) was found in a catepillar infested estate at Kurunegala. This emerged from the cocoons of *Goniozus nephantidis*. These hyperparasites could reduce the efficiency of the parasitoids of *O. arenosella* in the field.

*P. Kanagaratnam, K. F. G. Perera and K. A. S. Chandrasiri.*

**Table 11**—*Numbers of parasitoids released in different provinces for the control of Opisina arenosella in* 1987.

| *Province* | *Goniozus nephantidis* | *Bracon hebetor* | *Trichospilus pupivora* | *Eriborus trochanteratus* | *Antrocephalus pandens* | *Brachymeria nephantidis* | *B. nosatoi* | *Stomatomyia bezziana* | *Elasmus nephantidis* |
|---|---|---|---|---|---|---|---|---|---|
| Western | 29,400 | 120,750 | 624,350 | 9,700 | — | 1,535 | 6,175 | — | 8.900 |
| North Western | 42,750 | 209,400 | — | 10,650 | — | 1,800 | 600 | — | 750 |
| Southern | 5,750 | 159,500 | 164,800 | 15,900 | — | — | — | — | 250 |
| Central | 12,250 | 52,500 | 268,800 | 3,250 | — | — | 600 | — | 450 |
| Northern | — | — | 4,200 | 2,000 | — | — | — | — | — |
| Eastern | 50,825 | 286,000 | — | 3,000 | 2,245 | 2,370 | — | 4,635 | — |

## 4. SERVICE AND EXTENSION ACTIVITIES

Infestation of *Opisina arenosella* were recorded from Southern Eastern, North Western, North Central, Northern and Central Provinces.

As in the past assistance was provided to growers to control outbreaks of this pest. In most of the caterpillar infested estates, parasitoids were released. The numbers of parasitoids released are given in Table 11.

## 5. VISITS

The following scientists from the United Kingdom visited the division in connection with the collaborative project which was sponsored by the Commission of European Communities, (C.E.C.).

| | | | |
|---|---|---|---|
| Mr. M. E. Cammell | S.C.P.M. | 9 March | 5 April |
| Prof. M. J. Way | S.C.P.M. | 16 March | 10 April |
| Dr. John Mumford | S.C.P.M. | 31 August | 14 September |
| Dr. Charles Godfray | S.C.P.M. | 4 — 18 September | |
| Mr. Peter S. Beevor | ODNR (=TDRI) | 2 — 30 September | |

## 6. LECTURES, WORKSHOPS ETC.

Dr. P. Kanagaratnam, Dr. P. A. C. R. Perera, Mrs. L. C. P. Fernando and Mrs. C. N. K. Rajapakse were resource persons for the Diploma of the National Institute of Plantation Management.

Mrs. L. C. P. Fernando and Mrs. C. N. K. Rajapakse delivered several lectures on coconut pest control to the trainees in courses organised by the Coconut Cultivation Board.

## 7. PUBLICATIONS


1. Cock, M. J. W. & Perera, P. A. C. R. (1987). Biological control of *Opisina arenosella* Walker (Lep. Oecophoridae). *Biological control News and Information* 8, 283—310.

2. Fernando, L. C. P. & Kanagaratnam, P. (1987). New records of some pests of the Coconut Inflorescence and Developing Fruit and their Natural Enemies in Sri Lanka. COCOS 5, 39—42.

3. Perera, P. A. C. R. (1987). New Technologies in Crop Protection—*Coconut Bulletin* 4, 23—24.

## 8. PAPERS PRESENTED

1. Perera, P. A. C. R.—New Technologies in Crop Protection (in Sinhala) Coconut Research Conference, 18 May, Koggala, Habaraduwa.

2. Mahindapala, R. Introduction of the Oil Palm Pollinating Weevil, *Elaeidobius kamerunicus* to Sri Lanka, Annual Sessions, Sri Lanka Association for the Advancement of Science, December 1987.

3. Rajapakse, C. N. K. Kanagaratnam, P. and Croos, P. K. K. Studies on the Reproductive Biology of *Rhynchophorus*, the red palm weevil of coconut. Annual Sessions, Sri Lanka Association for the Advancement of Science, December, 1987.

## 9. ACKNOWLEDGEMENTS

We are grateful to the Commission of European Committees for sponsoring the collaborative projects between the CRI SCPM and ODNRI (TDRI).

We express our sincere thanks to Dr. C. C. Payne, Head, Crop Protection Division, and Dr. M. F. Clark, Plant Pathology Section, of the Institute of Horticultural Research, England for examining coconut tissues for Mycoplasma Like Organisms (MLO) from palms showing Leaf Scorch Decline and Palms showing tapering symptoms.

We are grateful to Mr. Paul Richardson and his staff at the Insect Nematology Section of the Institute of Horticultural Research (Glasshouse Crops Research Institute, Littlehampton) in England for screening nematode pathogens against *Rhynchophorus ferrugineus* and *Oryctes rhinoceros* in their laboratory.

We sincerely thank Mr. G. B. Pillai, Head, Entomology Division and the authorities at the Regional Station at Kayangulam of the Central Plantation Crops Research Institute, Kerala, India for sending us cultures of *Brachymeria nosatoi* and *Elasmus nephantidis*.

We also thank the C. A. B. International Institute of Entomology, London for identifying the insects.

# REPORT OF THE BIOMETRY UNIT

**Senior Biometrician—D. T. Mathes B.Sc.**

## 1. GENERAL

Mr. T. S. G. Pieris, Biometrician, participated in a training course in Applied Statistics, Statistical computing and computer application from 02 January to 02 July at the University of Reading, University of Edinburgh and Rothamsted Experimental Station. During his stay he visited several agricultural research stations in Scotland. The training was sponsored by the British Council.

Mr. D. T. Mathes was promoted to Executive Grade Class I with effect from 10 June. Messrs J. Wijedasa and P. J. C. Fernando were promoted to Operative Grade Class I with effect from 01 June 1985 and 01 June 1986 respectively.

## 2. BIOMETRICAL SERVICE

Assistance to the research staff was provided by way of statistical designs, selection of lands, layout of experimental plots, analysis and interpretation of results. In all, 441 analyses of data were carried out during the year.

Special assistance was given to Messrs M. de. S. Liyanage and Neville Fernando in their Ph. D. Projects.

Work on computerising experimental data, commenced early in the year, progressed satisfactorily. Using the large volume of data available from experiments, it is expected to develop a data base.

## 3. RESEARCH PROJECTS

### PROJECT 19—APPLICATION OF BIOMETRY IN COCONUT RESEARCH

**Experiment 19.3—Cablibration trial at Walpita Estate (Wet Zone)—1984**

The bimonthly recordings of vegetative and yield characters of the palms were carried out without interruption. Variation of the yield parameters between the six picks of 1986 and 1987 are given in Tables 1 and 2.

Except for the 2nd and 5th pick, the rest of the picks showed a slight reduction in the number of bunches per palm compared with 1986. The overall reduction compared with 1986 was neglegible. Number of nuts per palm showed an increase in the 2nd and 3rd picks. The rest of the four picks showed a decrease over the year compared with 1986 The overall decrease compared with 1986 was 8.6%. A pattern similar to the number of nuts/palm was observed for nuts per hectare.

**Table 1** *Average yield components in* 1987 (*Experiment* 19.3)

| | *1st pick* | | *2nd pick* | | *3rd pick* | | *4th pick* | | *5th pick* | | *6th pick* | | *TOTAL* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1987 | 1986 | 1987 | 1986 | 1987 | 1986 | 1987 | 1986 | 1987 | 1986 | 1987 | 1986 | 1987 | 1986 |
| No. of bunches/palm | 2.3 | 2.5 | 3.1 | 2.3 | 2.4 | 2.5 | 2.1 | 2.6 | 2.0 | 2.0 | 1.9 | 2.0 | 13.8 | 13.9 |
| No. of nuts/palm | 7.9 | 13.2 | 25.9 | 17.2 | 27.6 | 25.7 | 20.7 | 26.3 | 9.2 | 12.5 | 5.2 | 10.1 | 96.5 | 105.0 |
| No. of nuts/hectaer | 1246 | 2080 | 4090 | 2725 | 4362 | 4070 | 3272 | 4156 | 1448 | 1974 | 822 | 1597 | 15240 | 16602 |
| No. of nuts/bunch | 3.4 | 5.2 | 8.4 | 7.6 | 11.5 | 10.3 | 10.1 | 10.1 | 4.5 | 6.1 | 2.7 | 5.0 | | |

**Table 2.** *Average weight of husked nut, and copra yield—in* 1987. (*Experiment* 19.3)

| *Pick* | *Weight of husked nut (g)* | | *Copra** (kg/ha)* | |
|---|---|---|---|---|
| | 1987 | 1986 | 1987 | 1986 |
| 1 | 760 | 661 | 257.40 | 416.02 |
| 2 | 670 | 715 | 538.26 | 600.95 |
| 3 | 610 | 653 | 618.22 | 746.60 |
| 4 | 540 | 620 | 535.02 | 764.33 |
| 5 | 440 | 667 | 173.23 | 375.82 |
| 6 | 570 | 747 | 133.73 | 352.64 |
| Total/Ave. | 620 | 667 | 2255.86 | 3256.36 |

* Copra yield = husked nut weight x 0.32

There was an overall reduction in the weight of husked nut from 670 g in 1986 to 620 g in 1987. This reduction was considerable in the 5th pick.

The copra yield per hectare for 1986 was 3256 kg while for 1987 it was 2256 kg; a reduction of 30.7%.

## 4. YIELD RECORDING

The recording of yield data from 21 experiments was continued satisfactorily at the following estates.

1. Bandirippuwa
2. Ratmalagara
3. Heemmeliyagara
4. Kiniyama
5. Jacintha
6. Muthugala
7. Puwakwatte
8. Sirikandura

## 5. MISCELLANEOUS

### (a) Lectures and symposia

(i) "SAS"—A Micro Computer Software for Agricultureal Research" lecture organised by Section B of the Sri Lanka Association for the Advancement of Science by Mr. T. S. G. Pieris on 25 September.

(ii) Two lectures were delivered at the training course in Diploma in Plantation Management—by Messrs D. T. Mathes & T. S. G. Pieris.

### (b) General

(i) Mr. D. T. Mathes was appointed to the Diagnostic Team, whose responsibilities are to obtain on-farm information in the implementation of the Agriculture Research Project.

(ii) Mr. T. S. G. Pieris was awarded the Fellowship of the Royal Statistical Society.

## 6. AGRI-METEOROLOGY

The Three meteorological stations at Bandirippuwa estate, Ratmalagara estate and Isolated Seed Garden were maintained satisfactorily. The daily recordings taken throughout the year were rainfall, temperature, evaporation, humidity and soil temperature. The data from these stations were provided to the Dept. of Meteorology monthly and to a number of other Institutions on request.

### 7.1 Bandirippuwa Estate

#### Rainfall

Except for February, other months experienced rains of varying intensity. The total rainfall for the year was 2063.4 mm compared with 1190.9 mm in 1986. The rainfall during the 2nd half of the year was more than twice the rainfall during the 1st half. An increase in the crop in the 2nd half compared with the 1st half is indicated.

The rainfall since 1977, the ten year average and for 1987 are given in Table 3.

#### (b) Temperature

The overall average maximum temperature for the year was 31.5°C with a range of 30.1 to 34.0°C . January to May showed high temperatures ranging 31.9°C to 34.0°. A high temperature was observed throughout the year (Table 4).

#### (c) Evaporation

The evaporation ranged from 2.5 mm in December to 5.8 mm in February. The average for the year was 4.1 mm. January to May showed high evaporation rate as compared to the rest of the months (Table 4).

#### (d) Sunshine

The average sunshine for the year was 7.5 h with a range of 5.0 in August to 9.9h in February (Table 4).

#### (e) Soil Temperature

Soil temperature was recorded daily, morning and afternoon at depths 5,10,20,30,60 and 120 cm. The average temperatures for the year at the above depths were 28.8, 28.9, 29.9, 30.4, 30.6 and 30.5°C respectively, while the respective values for the afternoon were 32.5, 32.0, 31.2, 30.9, 30.5 and 30.5;C (Table 5).

### 7.2 Ratmalagara

The total rainfall for the year was 1510.9 mm with February experiencing no rains. October had the highest rainfall of 502.8 mm (Table 6). The rainfall during the 1st half and the 2nd half of the year were 412.6 mm and 1098.3 mm respectively (Table 6). The crop during the second half of 1985 is expected to be more than that in the first half.

### 7.3 Isolated Seed Garden

The total rainfall recorded during the year was 1302.4 mm against 1014.1 mm in 1986. The rainfall during the first half was 318.7 mm while that for the the 2nd half was 983.7 mm; a three fold increase over the first half (Table 7). A considerable increase in crop during the 2nd half over the 1st half could be expected in 1988.

**Table 3.** *Rainfall(mm) for the last* 10 *years and in* 1987

(*Bandirippuwa Estate*)

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 77-86-*Ave.* | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0.0 | 0.0 | 0.5 | 0.0 | 50.8 | 0.0 | 0.0 | 197.9 | 13.0 | 61.7 | 32.4 | 31.2 |
| February | 99.8 | 3.0 | 146.8 | 0.0 | 66.0 | 0.0 | 0.0 | 106.9 | 189.0 | 35.0 | 64.6 | 0.0 |
| March | 146.0 | 204.2 | 17.5 | 68.8 | 16.5 | 144.2 | 0.0 | 145.5 | 228.9 | 62.0 | 104.4 | 118.3 |
| April | 131.6 | 145.8 | 70.9 | 206.0 | 100.6 | 125.2 | 219.7 | 425.2 | 103.9 | 60.2 | 158.9 | 237.9 |
| May | 700.0 | 590.0 | 174.5 | 54.2 | 333.5 | 232.9 | 322.1 | 297.7 | 275.3 | 284.7 | 326.5 | 187.2 |
| June | 130.6 | 64.0 | 231.4 | 308.1 | 107.4 | 328.4 | 138.4 | 115.1 | 291.3 | 44.7 | 175.9 | 61.6 |
| July | 14.2 | 1.3 | 22.4 | 21.8 | 37.6 | 152.1 | 79.7 | 111.0 | 14.5 | 33.5 | 48.9 | 6.4 |
| August | 66.6 | 20.8 | 20.1 | 78.2 | 41.4 | 188.9 | 120.6 | 0.5 | 139.9 | 77.2 | 75.4 | 156.5 |
| September | 74.7 | 84.1 | 194.8 | 182.3 | 124.2 | 185.2 | 242.1 | 129.3 | 168.4 | 94.7 | 148.0 | 410.7 |
| October | 656.1 | 260.3 | 203.2 | 364.4 | 298.4 | 235.7 | 50.0 | 121.9 | 195.6 | 224.3 | 261.0 | 579.3 |
| November | 322.3 | 455.9 | 364.5 | 184.9 | 297.2 | 244.6 | 159.0 | 239.8 | 306.3 | 149.4 | 272.4 | 194.7 |
| December | 12.4 | 169.7 | 162.3 | 102.3 | 12.9 | 57.7 | 141.0 | 83.0 | 63.7 | 63.5 | 86.8 | 79.9 |
| TOTAL | 2354.3 | 1999.1 | 1608.9 | 1571.0 | 1487.5 | 1894.9 | 1472.6 | 1973.8 | 1989.8 | 1190.9 | 1754.2 | 2063.4 |

**Table 4.** *Summary of meteorological observations in* 1987
(*Bandirippuwa Estate*)

| | *Temperature C°* | | *Temperature* per day | *Relative Humidity Evaporation (mm)* % | | *Sunshine (h)* |
|---|---|---|---|---|---|---|
| | *Max.* | *Min.* | | *a.m.* | *p.m.* | |
| January | 32.2 | 22.2 | 4.5 | 78 | 57 | 8.0 |
| February | 34.0 | 20.5 | 5.8 | 72 | 54 | 9.9 |
| March | 33.5 | 22.7 | 5.6 | 73 | 61 | 9.8 |
| April | 31.9 | 24.0 | 4.2 | 76 | 71 | 6.7 |
| May | 32.1 | 23.4 | 4.1 | 79 | 71 | 8.2 |
| June | 30.7 | 23.9 | 3.4 | 81 | 75 | 5.5 |
| July | 30.9 | 25.1 | 4.2 | 77 | 71 | 8.9 |
| August | 30.1 | 23.9 | 3.6 | 83 | 77 | 5.0 |
| September | 30.7 | 23.2 | 3.9 | 83 | 75 | 7.4 |
| October | 30.4 | 23.2 | 3.9 | 87 | 80 | 5.5 |
| November | 30.5 | 23.0 | 3.1 | 84 | 77 | 7.0 |
| December | 30.8 | 22.1 | 2.5 | 82 | 73 | 8.2 |
| Ave. | 31.5 | 23.1 | 4.1 | 80 | 70 | 7.5 |

**Table 5** *Soil temperature (°C) at different depths (Bandirippuwa Estate)*

| | *Morning* | | | | | | *Afternoon* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5*cm* | 10*cm* | 20*cm* | 30*cm* | 60*cm* | 120*cm* | 5*cm* | 10*cm* | 20*cm* | 30*cm* | 60*cm* | 120*cm* |
| January | 27.5 | 27.9 | 29.0 | 31.2 | 30.5 | 30.4 | 33.4 | 33.0 | 31.5 | 31.1 | 30.5 | 30.5 |
| February | 29.0 | 29.6 | 30.9 | 32.0 | 32.4 | 31.6 | 38.4 | 36.7 | 34.1 | 33.0 | 32.3 | 31.8 |
| March | 30.7 | 31.1 | 32.0 | 33.2 | 33.9 | 33.4 | 38.6 | 37.3 | 35.2 | 34.3 | 33.9 | 33.2 |
| April | 30.2 | 30.2 | 30.8 | 31.8 | 32.1 | 32.0 | 33.6 | 34.0 | 32.7 | 31.8 | 32.0 | 32.0 |
| May | 30.4 | 30.3 | 31.0 | 31.8 | 31.9 | 31.6 | 33.9 | 33.4 | 32.8 | 32.7 | 31.8 | 31.6 |
| June | 29.4 | 29.6 | 30.1 | 30.8 | 30.8 | 30.8 | 31.3 | 31.1 | 31.0 | 31.2 | 30.7 | 30.8 |
| July | 29.3 | 29.6 | 30.2 | 30.8 | 30.8 | 30.7 | 31.9 | 31.6 | 31.1 | 31.2 | 30.7 | 30.7 |
| August | 28.9 | 28.8 | 29.3 | 29.9 | 30.0 | 30.2 | 30.5 | 30.2 | 30.0 | 30.2 | 30.0 | 30.2 |
| September | 28.5 | 28.5 | 28.8 | 29.4 | 29.4 | 29.6 | 30.9 | 30.6 | 30.1 | 30.0 | 29.5 | 29.6 |
| October | 27.9 | 27.7 | 28.2 | 28.5 | 28.8 | 28.9 | 29.5 | 29.3 | 29.0 | 29.1 | 28.7 | 28.9 |
| November | 27.5 | 27.3 | 27.7 | 28.1 | 28.3 | 28.5 | 29.2 | 28.7 | 28.6 | 28.6 | 28.3 | 28.5 |
| December | 26.6 | 26.5 | 26.9 | 27.5 | 27.9 | 28.0 | 28.4 | 28.0 | 28.1 | 28.1 | 27.9 | 28.0 |
| Ave. | 28.8 | 28.9 | 29.6 | 30.4 | 30.6 | 30.5 | 32.5 | 32.0 | 31.2 | 30.9 | 30.5 | 30.5 |

**Table 6—*Rainfall (mm) for the last 10 years and in 1987***
***(Ratmalagara Estate)***

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 77-86 *Ave.* | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 1.0 | 0.0 | 0.0 | 0.0 | 78.7 | 0.0 | 0.0 | 132.9 | 16.6 | 64.8 | 29.4 | 13.6 |
| February | 49.5 | 0.0 | 167.3 | 0.0 | 11.3 | 0.0 | 0.0 | 166.2 | 122.1 | 54.3 | 57.1 | 0.0 |
| March | 186.7 | 89.3 | 16.9 | 16.7 | 38.4 | 118.8 | 0.0 | 168.6 | 158.3 | 74.7 | 86.8 | 72.0 |
| April | 157.5 | 69.7 | 70.6 | 208.2 | 52.5 | 112.2 | 109.2 | 703.6 | 208.3 | 143.4 | 183.5 | 120.4 |
| May | 625.8 | 410.0 | 46.9 | 74.0 | 290.8 | 196.8 | 145.3 | 282.4 | 82.3 | 246.1 | 240.0 | 141.5 |
| June | 67.3 | 15.1 | 46.1 | 246.1 | 87.4 | 190.8 | 80.9 | 39.1 | 126.0 | 50.9 | 95.0 | 65.1 |
| July | 23.3 | 6.5 | 28.8 | 14.3 | 55.1 | 35.6 | 55.6 | 88.6 | 39.1 | 22.6 | 37.0 | 16.9 |
| August | 35.4 | 27.5 | 46.1 | 31.2 | 80.4 | 155.2 | 74.9 | 2.0 | 13.3 | 85.9 | 55.2 | 139.5 |
| September | 58.3 | 54.0 | 125.6 | 149.0 | 121.6 | 36.6 | 109.9 | 132.8 | 84.2 | 26.4 | 89.8 | 190.0 |
| October | 565.9 | 302.0 | 316.3 | 239.6 | 168.9 | 272.8 | 79.5 | 109.3 | 209.9 | 153.0 | 241.7 | 502.8 |
| November | 166.4 | 540.3 | 377.3 | 273.2 | 304.0 | 200.8 | 163.6 | 472.8 | 319.0 | 228.4 | 304.6 | 195.9 |
| December | 73.8 | 55.7 | 272.6 | 126.4 | 24.2 | 118.7 | 216.3 | 95.9 | 104.4 | 95.9 | 118.4 | 53.2 |
| TOTAL | 2.010.9 | 1,570.1 | 1,514.5 | 1,378.7 | 1,313.3 | 1,438.3 | 1,035.2 | 2,394.2 | 1,483.5 | 1,246.4 | 1,538.5 | 1,510.9 |

**Table 7**—*Rainfall (mm) for the last* 10 *years and in* 1987
(*Isolated Seed Garden*)

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 77-86 *Ave* | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 0.0 | 0.0 | 13.1 | 0.5 | 36.9 | 0.0 | 0.0 | 96.9 | 38.3 | 59.1 | 24.5 | 5.9 |
| February | 27.4 | 0.0 | 60.0 | 0.0 | 11.5 | 0.0 | 2.1 | 228.9 | 113.4 | 65.8 | 50.9 | 0.0 |
| March | 168.7 | 23.3 | 17.6 | 23.7 | 93.5 | 176.3 | 1.6 | 279.7 | 94.6 | 55.3 | 93.4 | 21.7 |
| April | 110.2 | 158.7 | 59.8 | 164.5 | 48.4 | 61.7 | 52.8 | 821.4 | 100.0 | 104.9 | 168.2 | 141.1 |
| May | 451.1 | 405.1 | 11.4 | 87.8 | 147.8 | 281.8 | 248.8 | 155.5 | 171.4 | 121.9 | 208.3 | 100.2 |
| June | 21.6 | 11.1 | 34.8 | 147.9 | 148.9 | 110.7 | 73.4 | 29.7 | 88.8 | 74.5 | 74.1 | 49.8 |
| July | 25.0 | 16.4 | 19.4 | 5.8 | 72.5 | 32.1 | 26.4 | 117.0 | 17.9 | 4.2 | 33.7 | 4.5 |
| August | 19.7 | 10.1 | 10.6 | 10.0 | 54.3 | 91.6 | 78.0 | 3.8 | 10.7 | 47.4 | 33.6 | 48.1 |
| September | 31.7 | 32.9 | 197.8 | 106.9 | 68.4 | 35.6 | 89.4 | 164.7 | 107.4 | 37.4 | 87.2 | 270.8 |
| October | 759.9 | 521.6 | 160.6 | 272.1 | 280.3 | 199.9 | 105.7 | 227.3 | 108.7 | 199.9 | 283.6 | 467.6 |
| November | 247.2 | 582.9 | 356.6 | 251.0 | 295.9 | 152.7 | 199.3 | 210.6 | 334.8 | 236.1 | 286.7 | 143.2 |
| December | 34.0 | 97.6 | 172.1 | 82.7 | 54.3 | 93.4 | 331.4 | 53.6 | 118.6 | 7.6 | 104.5 | 49.5 |
| TOTAL | 1,896.5 | 1,859.7 | 1,113.8 | 1.152.9 | 1,312.7 | 1,235.8 | 1,208.9 | 2.389.1 | 1,304.6 | 1.014.1 | 1,448.7 | 1,302.4 |

## REPORT OF THE TISSUE CULTURE UNIT

**Officer-in-Charge—S. M. Karunaratne, MSc.**

### 1. GENERAL

#### 1.1 Promotions

Mrs. S. M. Karunaratne, Executive Grade Class II to Class I (Senior Research Officer) with effect from 10 June. Miss C. K. Gamage, Technical Grade Class II to Class I with effect from 01 January, 1986.

### 2. RESEARCH PROJECTS

### PROJECT 18. STUDIES ON THE VEGETATIVE PROPAGATION OF COCONUT

**Experiment 18.1—In vitro culture of embryos of local varieties of coconut (1983).**

Culture of immature embryos excised from tender nuts of *Cocos nucifera* L. var. *typica* 6-7 months after anthesis was attempted with a view to develop a methodology for zygotic embryo cloning. The embryos produced a fast-growing embryogenic callus when cultured in a medium developed in this laboratory for coconut leaf culture, following the broad spectrum tissue culture experiment of de Fossard (1976). About 50% of the embryogenic callus cultures produced globular embryos in low auxin media. The embryos in 22% of these cultures developed 6 mm long shoots when 6-benzylamino purien and kinetin were incorporated into the culture medium. Further investigations are in progress to improve the culture conditions for production of plantlets.

*S. M. Karunaratne and L. K. Periyapperuma.*

**Experiment 18.2—Inevstigations on development of vegetative propagules in coconut inflorescences *in vivo* (1983)**

Injection of hormone combinations (Indole butyric acid and benzyl amino purine) as described earlier (see Annual Report, 1986) was carried out four times during the year.

The treatments had no effect on the general morphology of the emerging vegetative and floral structures. Percentage setting of immature nuts and the pollen viability of individual palms were recorded during the year.

The experiment is in progress.

*S. M. Karunaratne and N. Jayatisse.*

**Experiment 18.3—Culture of leaf explants of coconut *in vitro* (1983).**

The leaf culture medium developed in this laboratory was further improved during the year to enhance the production of globular embryo-like structures from the leaf. About 50% of the leaf cultures generated globular structures. The number of globules produced per leaf explant ranged from 5-20. Low concentration of 2, 4-Dichlorophenoxy acetic acid was observed to be essential for efficient embryogenesis. Germination of the embryo-like structures was poor and inconsistent. However, these structures developed white compact callus tissues on transfer to media containing low minerals and organics.

These experiments are in progress and are partly supported by a grant from USAID.

*S. M. Karunaratne and C. K. Gamage.*

**Experiment 18.4—Culture of coconut floral meristem explants (1986).**

Attempts were made to culture flower meristems excised from tender inflorescences. The explants produced callus when cultured in media supplemented with 10 m 2. 4—Dichlorophenoxy acetic acid but no organogenesis was observed except sporadic rhizogenesis in some cultures.

*L. K. Periyapperuma and S. M. Karunaratne.*

**Experiment 18.5—Application of embryo culture technology to select drought tolerant coconuts in a population (1986).**

This investigation was undertaken with the objective of developing an *in vitro* method for selection of stress tolerant coconut germplasm. Nearly 1000 embryos extracted from nuts selected randomly were cultured in media stressed with Polyethylene glycol (PEG) and sodium chloride.

At low concentrations of PEG, the embryos developed slowly into seedlings but died before transfer to 5.0% PEG. In NaCl—stressed media, the survival of seedlings was 12% at 290 mmol and 6.0% at 320 mmol. In contrast, 58% of the embryos cultured in the non-stressed medium developed into seedlings. The seedlings sensitive to 200-290 mmol NaCl turned yellow and withered gradually. The NaCl tolerant seedlings remained green and produced more lateral roots compared to those in the non-stressed control medium. The growth rate was also observed to be low in the stressed plants. This experiment is now being continued using nuts from putatively drought tolerant palms at the Isolated Seed Garden at Ambakelle and it is expected to determine the maximum concentrations of PEG and NaCl at which the drought tolerant forms of coconut will just survive.

*S. M. Karunaratne, K. D. Cecily, A. Kovoor.*

## 3. VISITS, LECTURES AND SYMPOSIA

Mrs. S. M. Karunaratne participated in the FAO/ICAR—organized expert consultation on the use of tissue culture in plant quarantine for exchange of planting materials, held in New Delhi, India from 26 February to 2 March and presented a paper on use of tissue culture in plant quarantine for exchange of planting materials in Sri Lanka. In September, Mrs. Karunaratne participated in the British Council—organized Workshop on Recent Advances in Plant Tissue Culture for crop production and improvement held in University of Bath, England. Financial support was provided by USAID from the grant, RG/AID/04 awarded for coconut tissue culture.

## 4. PUBLICATIONS

1. J. Sossou, S. M. Karunaratne and A. Kovoor (1987) Collecting palm; *In vitro* explanting in the field. *FAO/IBPGR Plant Genetic Resources Newsletter* 69; 7-18.

2. S. M. Karunaratne (1987) Tissue Culture towards better coconuts. *Coconut Bulletin* 4: 6-10.

## 5. REFERENCES

dE FOSSARD, R. A. (1976) The broad spectrum tissue culture experiment, In: Tissue Culture for plant propagators, University of New England printery. pp. 132-149.

# REPORT OF THE PLANT PHYSIOLOGY UNIT

**Officer-in-Charge—C. Jayasekara, B.Sc.**

## 1. GENERAL

### Transfers

Mrs. P. K. K. Fernando, Technical Assistant, was transferred from Crop Protection Division on 01 February.

Mr. S. Samaratunga, Cattle Keeper, was transferred from Estates Management Division on 08 September.

### Promotions

Mr. W. Sirisena, Laboratory and Field Attendant from Minor Grade Class I to Minor Grade Special Class, with effect from 01 Janury 1985.

## 2. LABORATORY AND GLASSHOUSE INVESTIGATIONS

**Experiment 16.6—Studies on the effect of N, K, Cl and Abscisic acid on drought tolerance of coconut seedlings (1987).**

A sand culture experiment was commenced in November to determine the effect of N, K, Cl and abscisic acid on the stomatal regulation and internal water balance of coconut seedlings. Three levels of N, K, and Cl and three different watering regimes to induce soil moisture deficit will be tested. This experiment is a 3 x 4 factorial, confounded block design with nine blocks and each block with nine replicates. This study is partially supported by a grant from the Canadian international Development Assistance (CIDA) programme.

*C. Jayasekera, P. K. K. Fernando.*

## 3. RESEARCH PROJECTS

## PROJECT 16—STUDIES ON THE PHYSIOLOGY OF DROUGHT TOLERANCE IN THE COCONUT PALM

**Experiment 16.3—Identification of physiological and biochemical characters of putative drought tolerant tall (Ambakele special) palms, Isolated Seed Garden, Anbakele (1986).**

Monitoring of leaf water potential stomatal diffusive resistance, and the rate of transpiration was carried out at bi-weekly intervals during the year. The soil moisture content upto one meter depth was measured at two-month intervals in the field where the experimental palms are grown. Available results do not indicate a statistically significanct in transpiration and leaf water potential of putative drought tolerant palms and ordinary tall palms (Fig. 1). However, there is an indication that Ambakele special palms when compared with ordinary tall are marginally higher water users and are able to extract water even at low water potential. Pan evaporation measurements which will be useful for interpretation of results will be collected from next year.

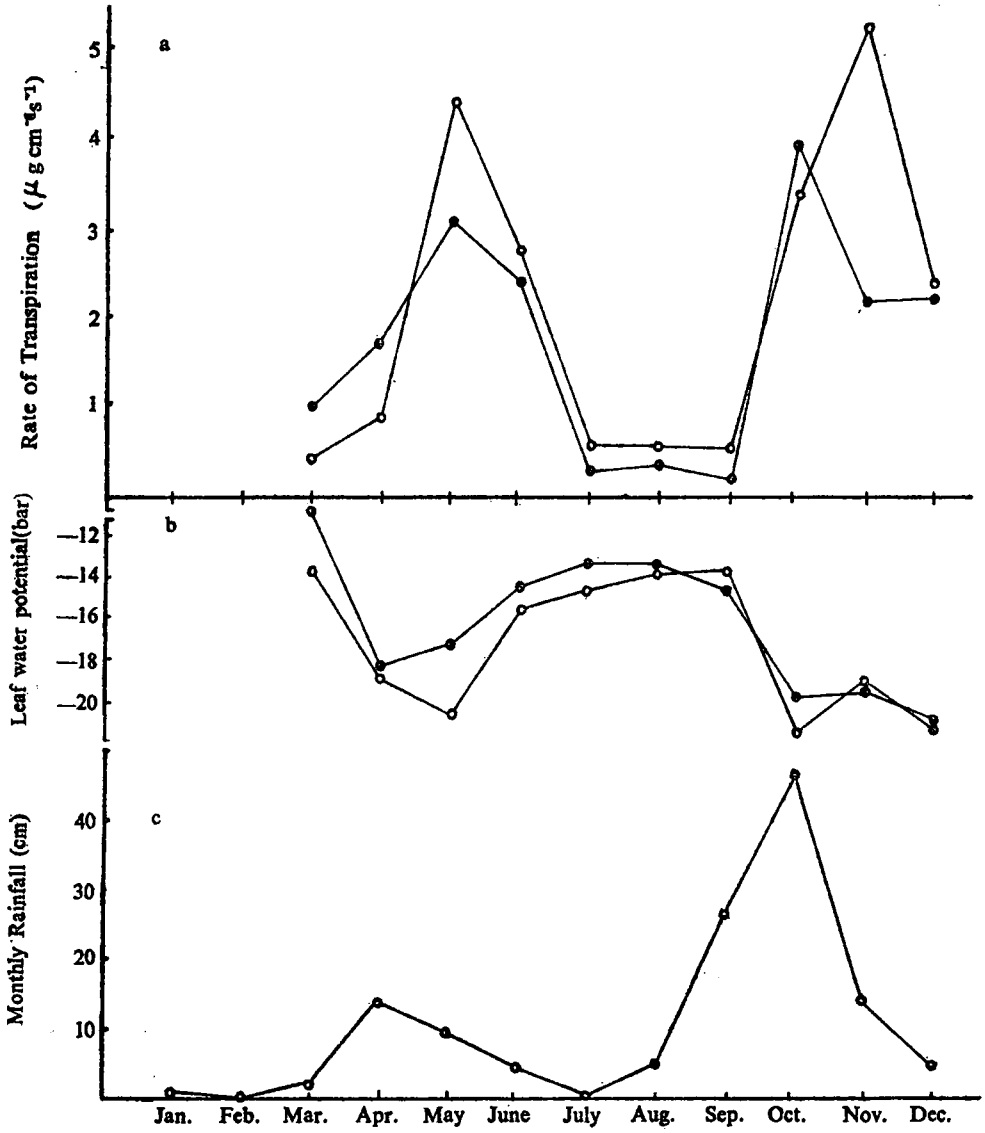


Fig. 1 Transpiration (a) Leaf Water Potential (b) of Ambakelle Special (o) and tall x tall (●) palms. Monthly rainfall at Isolated Seed Garden, Ambakelle is given in C.

This study was extended to investigate the floral characteristics such as number of female flowers per inflorescence, percentage nut setting, at three months and six months after opening. Measurement of soil moisture content near each palm upto a depth of 1.5 m using a Neutron Probe was commenced in December in collaboration with Soils and Plant Nutrition Division.

*C. Jayasekera, S. P. Suriyapperuma, A. D. N. Premasiri.*

**Experiment 16.4—Comparative study of physiological and biochemical determinants of drought tolerance in Ambakele Special and tall x tall seedlings (1987).**

Twenty seedlings were raised from each of the experimental palms selected for experiment 16.3 Later, nine uniform seedlings were selected from each lot of 20 seedlings considering the duration for germination and other growth characters. Four months after the establishment of these seedlings, leaf water potential, stomatal diffusive resistance, and transpiration were measured at two-weekly intervals under the field capacity condition.

Three treatments will be imposed on these seedlings. They are: withholding water for two weeks ($W_1$), withholding water for one month ($W_2$) and regular watering ($W_3$) upto the field capacity. Similar measurements as in 16.3 as well as stomatal density and percentage stomatal opening during the day will be studied. The experiment is in progress.

*C. Jayasekera, S. P. Suriyapperuma, P. K. K. Fernando.*

**Experiment 16.5—Identification of physiological and biochemical determinants of drought tolerance in selected dwarf parent palms at the Isolated Seed Garden, Ambakele (1987).**

Ten palms each of high yielding and low yielding dwarfs (green colour form) were selected from Field No. 14 at the isolated Seed Garden. Collection of plant water relations parameters such as leaf water potential, rate of transpiration, and stomatal diffusive resistence was commenced in October.

*S. Suriyapperuma, P. K. K. Fernando, R. D. N. Premasiri.*

## PROJECT 17—PREMATURE DECLINE OF PALMS

**Experiment 17.2—Studies on the root system of leaf scorch palms (1987).**

The root system within 1/8 th sector of the manure circle was exposed in one healthy palm and two palms showing leaf scorch decline, one in sandy clay soil and the other in gravel soil. It was observed that the healthy palm had a greater number of living roots than the leaf scorch affected palms. Some of the roots in the affected palms were found to be either dead, decaying, malformed or excessively thickened. Very few healthy roots were observed in the affected palms. This study could not progress due to adverse weather conditions, but will be continued and expanded to evaluate root morphology, anatomy, and functional characteristics of the affected palms vis-a-vis healthy palms.

*C. Jayasekera, R. D. N. Premasiri.*

**Miscellaneous studies on leaf scorch decline**

(*a*) Investigation of the heritability of the Leaf Scorch Decline (LSD).

Analysis of data from the Isolated Seed Garden did not yield a significant relationship between the severity of Leaf Scorch decline in the progeny and its female parent. The effect of pollen parent on the expression of LSD in the progeny could not be studied due to the difficulties in tracing the pollen parent.

*C. Jayasekera, S. P. Suriyapperuma.*

## PROJECT 25—STUDIES ON THE ESTABLISHMENT AND FURTHER GROWTH OF AMPUTATED SEEDLINGS IN POLYBAGS.

### Experiment 25.3—Studies on the suitable age of the seedlings for transplantation in polybags (1987).

Seedlings were amputated 4, 6, 8, 12 and 16 weeks after the emergance of the shoot. Roots of the amputated seedlings were dipped in 0.1% Indole Butyric Acid (IBA) solution for 12 h and planted in 10 x 20 cm polybags containing soil pretreated with a 1% solution of $Cuso_4$ to reduce the fungal population.

Fifty per cent of the seedlings planted at four and six weeks after sprouting remained viable four months after transplanting. The viability of seedlings in other treatments was about 20%.

In order to increase the seedling viability, roots of the amputated seedlings were immersed in 1/4 strength Hoagland's nutrient solution with 0.1% IBA and aerated in a mechanical shaker. One batch of these seedlings was planted in polybags after one week and the other batch after two weeks. The experiment is in progress.

*C. Jayasekera, R. D. N. Premasiri*

## PROJECT 18—STUDIES ON THE VEGETATIVE PROPAGATION OF COCONUT

### Experiment 18.4—Studies on the field performance of the Embryo-Cultured Seedlings, Bandirippuwa Estate, (1987).

Twenty embryo cultured seedlings, (14 dwarf and 6 D x T hybrids) received from the Tissue Culture Unit were planted in the 50 acre block in September. These seedlings were hardened for more than six months in a shade house prior to planting in the field. Vegetative growth parameters were collected at planting and in December.

*C. Jayasekera, R. D. N. Premasiri*

## 4. OTHER ACTIVITIES

Three National Diploma Trainees from the Hardy Technical College underwent training in the Unit.

## 5. ACKNOWLEDGEMENTS

Mr. D. T. Mathes, Officer-in-Charge of the Biometry Unit and their staff for design of experiments and statistical analysis of the data.

# REPORT OF THE INFORMATION SERVICE UNIT

**Officer-in-Charge—P. A. Henry N. Appuhamy, B.Sc. Agric.**

## 1. GENERAL

### Staff Matters

### Appointments

Mr. J. L. J. G. Pinto was appointed Assistant Information Officer and assumed duties on 1 June.

### Promotions

Mr. D. W. Hapuarachchi, from Operative Grade Class 1 to Special Class, effective 1 January 1985.

Mr. R. A. L. C. Fernando, from Clerical and Allied Grade Class 11 to Class 1, effective 1 January 1986.

Mr. J. K. C. W. N. Perera, from Minor Grade Class 11 to Class 1, effective 1 January 1985.

### Resignation

Mr. J. K. F. Kirthisinghe, Senior Technical Assistant, 18 January.

## 2. PUBLICATIONS

### 2.1 Technical Publications

Volume 4 of COCOS was published.

Annual Report of the Institute for 1986 was published.

### 2.2 Extension Publications

The following publications were issued during the year.

Pol Pawath-Volume 10 No. 1

Coconut Bulletin—Volume 3 No. 2 and Volume 4 No. 1

### 2.3 Advisory Circulars

The following Advisory Circulars in the new series were issued during the year

1. Planting of Coconut (No A 1)
2. Mineral Deficiencies (No A 5)
3. The Red Weevil Pest (No B 3)
4. Intercropping in Coconut Lands (No C 1)
5. Intercropping with Cocoa (No C 2)
6. Intercropping with Coffee (No C 3)
7. Intercropping with Pepper (No. C 4)

## 3. TRAINING PROGRAMMES/STUDY TOURS

### 3.1 Training Programmes

The following training programmes were organized.

(i) Attachment training for three batches of students from the National Apprenticeship Board from 15 January to 31 December.

(ii) A short familiarization programme for six officers from the office of the Rubber Replanting Aid Fund, Thailand on 27 March.

(iii) Attachment training for two FAO fellows from Vietnam, Mr. Hua, Duc Truong and Mr. Vo Van Long. They were attached to the Crop Protection Division and Genetics and Plant Breeding Division respectively, from May to October.

(iv) Attachment training for four FAO fellows from Pakistan, M/s A. M. Soomro M. Ahamed, M. Iman and N. A. Kazi from July to October.

(v) Attachment training for students from Technical College, Kuliyapitiya (10 months) and Miss E. P. L. N. Siriyalatha from Rununu University (May to November).

(vi) CRI component of the Diploma Course of the National Institute of Plantation Management from 13 July to 27 July.

### 3.2 Study Tours

The following study tours were organised for the persons indicated.

(i) Members of the Institute of Chemistry on 29 March

(ii) Officers from the Livestock Management Training Centre, Kotadeniyawa on 9 June.

(iii) Group of trainees from the Coconut Development Training Centre on 27 August.

## 4. VISITORS

A large number of persons visited the Institute during the year, including 636 students from 9 schools.

## 5. SEMINARS

1. The Institute organised a seminar on Coconut Development for coconut growers in the southern province at Koggala Beach Hotel on 18 May. This was followed by field demonstrations on intercropping, soil moisture conservation and manuring at Sirikandura Division of the Monrovia State Plantation, Ratgama.

2. Quarterly seminar on Quality control of Coconut Products was held at the Coconut Development Training Centre on 26 August.

3. The Institute arranged resource persons to deliver talks at a seminar sponsored by the Dunagaha Coconut Producers Co-op Society and organized by the Coconut Cultivation Board, held on 19 December,

4. The Institute also participated in the Mahapola Agricultural Seminar held at Nagoda Maha Vidyalaya, Nagoda in February.

## 6. EXHIBITIONS

The Institute participated in the following exhibitions during the year.

(i) Mahapola Seventh Anniversary Exhibition held at Nagoda Maha Vidyalaya, Nagoda.

(ii) Agro Mahaweli 1987 exhibition held at Embilipitiya

(iii) Agro Mart Trade Fair organized by the Women's Chamber of Commerce held at the Race Course, Colombo.

(iv) Gam Udawa 1987 exhibition organized by the Ministry of Local Government Housing and Construction held at Kataragama.

(v) The Institute assisted in providing exhibits to the Science Exhibition held at the Sangamitta Balika Vidayalaya, Galle.

## 7. PHOTOGRAPHY

Transparancies and photographs required for technical divisions were prepared.

## 8. MUSEUM AND GRAPHIC WORK

The Museum was maintained satisfactorily. Line drawings and other graphic work required for publications and divisions were prepared.

# REPORT OF THE COCONUT INFORMATION CENTRE

**Project Leader—M. J. C. Perera, ALA**

## 1. GENERAL

The Coconut Information Centre continued its activities, commenced during 1987, in fulfilling the objectives of phase II of the project with financial assistance from the International Development Research Centre, Canada (IDRC), supplemented with local funds. The publications programme, microfiching of documents, collection of missing literature received much attention during the year.

### 1.1 Staff

The staff position as at 31 December remained as Project Leader (1), Library Assistants (2) and Clerical Assistant (1). In addition, services of one Library Assistant, one Machine Operator and four Supporting Staff were provided by the Institute. One casual typist was engaged to cover up the work in order to expedite the publications programmes.

### 1.2 Training

Mr. M. J. C. Perera, Project Leader attended an in-depth training course on Mini-Micro CDS/ISIS for Information Management, sponsored by the UNESCO and conducted at the Asian Institute of Technology, in Bangkok from 19-31 January.

Miss T. I. I. Peiris, Library Assistant attended a training programme on Library Automation held at the University Sains Malaysia, Penang from 20 April to 23 May. Her participation was sponsored by the IDRC.

## 2 VISITORS

In addition to students and trainees from various Universities and Institutes and a few industrialists who visited the Centre to collect information, following important visitors were also received.

Mr. Truong Hun Duc and Mr. Vo Van Long from Vietnam
Mr. Peter Bieler from Switzerland
Dr. U. Pethiyagoda, Colombo
Mr. R. F. Carscadden, IDRC, India
Prof. Michael Way, Dr. J. Mumford, Dr. C. Godfray and Mr. M. Camell from Imperial College at Silwood Park
Mr. T. A. Karunaratne, Salford University
Mr. P. S. Beever, TDNRI, U. K.
Dr. N. E. Gunawardena, University, Kelaniya
Dr. (Miss) M. Pallewatta and Dr. (Mrs.) D. G. Senanayake, University of Colombo
Dr. B. Thapa, UNDP
Mr. K. Kawaguchi, F.A.O.
Following groups of visitors were also received.
Participants of the Workshop on Edible oils held in Sri Lanka.
Officers from the office of Rubber Replanting Aid Fund, Thailand.

## 3. EQUIPMENT

A Canon photocopier, Model NP-3025 and a 3M Transparency Maker were purchased during the year.

## 4. ACKNOWLEDGEMENTS

It is recorded with appreciation and due acknowledgement support received from the International Development Research Centre (IDRC), United Nations Education, Scientific and Cultural Organization (UNESCO), Asian Institute of Technology (AIT) and the Universiti Sains Malaysia for the training facilities provided for the staff in the use of computers in Information Management and Library Automation. We are also very grateful to the IDRC and the Coconut Research Board for providing funds and the Chairman, Coconut Research Board and the Directorate, Coconut Research Institute and Mr. Clive Wing, IDRC Programme Officer for cooperation extended at all times.

We also wish to record with due acknowledgement support we received from various Institutions and Universities in the world in providing missing literature to the Centre.

## 5. SERVICES

**Information Collection and Storage**—Literature on coconut cultivation and processing technologies recorded in various sources for the year was 260. Out of this, 205 items have been received and processed and recorded in the database. Further 38 theses were collected, bringing the total number of theses available at the Centre to 107. During the year 1356 items from retrospective literature from 1967 were processed and recorded in the database.

**Requests for Literature**—The missing 55 items from items recorded for 1987 were requested. Further 1060 items missing from the retrospective collection from 1967—1980 were requested from various sources. Of this, 426 items were received reflecting a 40% response.

**Supply of Information**—In addition to attending to information needs of the Institute's staff and visitors received at the Centre, 22 requests received from outside were successfully attended to by providing list of references and copies of articles.

**Microfiching of Documents**—This work started in 1986 was continued during the year and 1470 items have been microfiched, bringing the total number of microfiched articles to 1600. This work involved photocopying of articles, numbering them according to the numbers in bibliographies, key-wording and storing the articles in box files after microfiching. Much staff time was spent on this work after normal office hours.

## 6. PUBLICATIONS

**Annotated Bibliographical Series**—A combined volume Nos. 16-17 covering literature received during the years 1983—1984 was published. This series included 456 references with abstracts.

Another combined volume Nos. 18-19 covering the period 1985—1986 with 486 references with abstracts has been processed and typed set for printing.

**Retrospective Bibliographical Series**—Number 4 of this series covering thesis on coconut submitted to various universities in the world was published during the year. This series covers 167 references to these with abstracts. The oldest thesis recorded in this series goes back to 1856.

**Review Series No. 2**—This series covering 653 pest species on coconut, classified under Order, Class and Family has been completed and printed.

**Directory on Coconut Research Workers**—Information received from 465 research workers all over the world with ongoing research projects have been processed and entered into the computer database. These entries are now being submitted to various Institutions and individuals for re-checking before publishing.

**COCONIS Newsletter**—All four issues of this newsletter were published on schedule and circulated among 645 clients. In addition to above, considerable amount of printing on miscellaneous items was undertaken by the Centre for the Institute.

# REPORT OF THE LIBRARY

**Librarian—M. J. C. Perera, ALA**

## 1. GENERAL

### 1·1 Staff

Miss D. Indu Piyarisi, Library Assistant resigned with effect from 3 May, The staff position as at 31 December was Librarian (1), Library Assistant (1) and Supporting Staff (3).

## 2. ACQUISITIONS

During the year 24 new books were added to the collection, bringing the total book collection to 4448. The library continued to receive 113 journal titles including 16 Annual Reports on exchange and 54 journal titles on subscription.

## 3. SERVICES

While routine library services were carried out by way of classification, cataloguing, indexing and lending material from the available resources, 78 items were borrowed for use of the Institute's staff from other libraries within the country and 45 items purchased from the British Library Document Supply Services. Further, staff was alerted to 18 items selected from the journals received in the Library based on the subject profiles for Selective Dissemination of Information (SDI) available in the Library.

The Library continued its support to the Sri Lanka Scientific and Technical Information Centre (SLISTIC) by making available abstracting and indexing journals for the Sri Lanka Scientific and Technical Information Network.

The Library continued its links with the Agricultural Informaton Network (AGRINET) group by providing content pages of 36 journals received in the Library for use by AGRINET Libraries. Under this service the Library received content pages from 30 journals from other member libraries in the Network for use by the Institute's Staff.

## 4. VISITORS

Many students attached to various training programmes and assignments at the Institute as well as lecturers and students from various universities in the country visited the Library and used its resources.

# REPORT OF THE ESTATES MANAGEMENT DIVISION

**Manager (Estates) P. S. Liyanagama B.Sc (Agric)**

## 1. GENERAL

### 1.1 Staff matters

#### Transfers

Mr. Somapala Samarathunga (Cattle keeper) from Bandirippuwa Dairy to Plant Physiology Unit on 11 September.

Mr. L. Vanculenburg (Cattle keeper) from Bandirippuwa Dairy to Soils and Plant Nutrition Division on 10 September.

#### Resignations

Miss S. N. Weerapperuma (Clerk/Typist) on 30 April. Mr. W. M. K. Premaratne (Tractor Driver)—Rathmalagara Estate on 01 July.

Mr. R. P. Edmund (Watcher)—Rathmalagara Estate on 01 August.

Mr. W. Michael Dabarera (Watcher)—Rathmalagara Estate on 31 August.

#### Retirements

Mrs. A. M. Agnus (Gardener)—Bandirippuwa Estate on 08 January.

### 1.2 Activities

The following estates, seed gardens and other substations were administered by the Division.*

1. Bandirippuwa Estate, Lunuwila.
2. Rathmalagara Estate, Madampe.
3. Poththukulama Research Station, Pallama.
4. Walpita Estate, Walpita.
5. Kirimetiyana Estate, Lunuwila.
6. Makandura Seed Garden, Gonawila.
7. Maduru Oya Seed Garden, Bogaswewa, Dimbulagala.
8. Minneriya Research and Demonstration Farm, Minneriya.

Introduction of organic matter was encouraged and an extra—thick mulch was provided in manure circles covering an area wider than usual. All available husks were buried in the estates. Dimensions of the husk pits were changed from 4' x 4' x 3' (deep) into 5' x 3' x 3' (deep). They were established closer at 5 ft away from the bole facing the palm lengthwise. Estate staff were given a practical training in nursery management, with particular emphasis on raising polybagged seedlings. Modified data recording systems and cost control methods were successfully employed to reduce the cost of production, thereby making a saving of nearly Rs. 1.1 million. Rainfall in general had been below the normal. This will reduce the yield in 1988.

The general performance of the estates etc. is given in Table 1.1

**Table 1.1** *General Performance of Estates etc.*—1987

| | | *BE* | *RE* | *PRS* | *WE* | *XE* | *MX* | *MO* | *MIN* | *PAS* | *TOTAL* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total extent (ac) | .... | 365 | 273 | 212 | 44 | 95 | 144 | 2100 | 125 | 117 | 1,585 |
| Planted extent (ac) | .... | 338 | 240 | 143 | 40 | 40 | 133 | 80 | 33 | 87 | 1,134 |
| Bearing extent (ac) | .... | 155 | 190 | 120 | 40 | 20 | — | — | — | 5 | 530 |
| Yield in 1987 (nuts) | .... | 307,754 | 638,981 | 565,342 | 172,326 | 16,718 | — | — | — | 840 | 1701,691 |
| Yield/palm (nuts) | .... | 31.0 | 56.0 | 82.5 | 82.1 | 13.0 | — | — | — | — | — |
| Yield/acre (nuts) | .... | 1,984 | 3,363 | 3,981 | 4,308 | 836 | — | — | — | — | — |
| Yield in 1986 (nuts) | .... | 464,637 | 874,843 | 483,031 | 188,995 | 22,577 | — | — | — | 126 | 2,034,083 |
| Percent difference over 1986 | .... | (–)33.8 | (–)27.0 | (+)17.0 | (–)8.8 | (–)26.0 | — | — | — | — | (–) 16.3 |
| Av. yield 1982–1986 | .... | 496,795 | 773,937 | 536,393 | 163,986 | — | — | — | — | — | — |
| Per cent difference over 5yr average | | (–)38.1 | (–)17.4 | (+)5.4 | (+)5.1 | — | — | — | — | — | — |
| C.O.P. (Rs) | .... | 2,805.12 | 1,047.00 | 849.00 | 1,096.48 | 7,850.00 | — | — | — | — | — |
| N.S.A. (Rs.) | .... | 2,449.11 | 2,055.57 | 2,146.47 | 2,256.65 | 1,919.00 | — | — | — | 1,245.45 | — |
| Replanting (ac) | .... | 5 | 2 | — | — | — | — | — | — | — | 7 |
| New planting (ac) | .... | — | — | — | — | — | — | 20 | 11 | — | 31 |

BE — Bandirippuwa Estate
RE — Rathmalagara Estate
PRS — Poththukulama Research Station
WE — Walpita Estate
KE — Kirinetiyana Estate

MK — Makandura Seed Garden
MO — Maduru Oya Seed Garden
MIN — Minneriya Farm
PAS — Passekudah Farm
COP — Cost of Production / 1,000 nuts
NSA — Net Sales Average / 1000 nuts

**2. Bandirippuwa Estate**—[Superintendent: Mr. A. N. Ekneligoda]

District — Puttalam
Electorate — Wennappuwa
Agro-climatic Zone — Semi-wet Intermediate Zone

Major part of the estate is under young plantations and only 185 ac of the planted area are in production.

**Table 2.1** *Area Statement, Bandirippuwa Estate*

| | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|
| Coconut .... .... | 138.83 | 338 | 0 | 17 |
| Road & Building .... .... | 6.88 | 17 | 0 | 00 |
| Vacant Land .... .... | 4.05 | 10 | 0 | 00 |
| Waste Land .... .... | 0.34 | 0 | 3 | 14 |
| | 148.10 | 365 | 3 | 31 |

**Table 2.2** *Census of Palms, Bandirippuwa Estate*

| | |
|---|---|
| Bearing palms .... .... | 9,940 |
| Young palms .... .... | 6,835 |
| Seedlings .... .... | 450 |
| Dud palms .... .... | 137 |
| Total .... .... | 17,362 |

Rainfall during the year had been better than the previous year (Table 2.3) indicating a 73% increase. However over 50% of the rainfall was received during the North-East monsoon and a dry spell was experienced at the beginning of the year.

**Table 2.3**—*Rainfall* 1986—1987 *Bandirippuwa Estate*

| | 1986 | | 1987 | |
|---|---|---|---|---|
| *Month* | *mm* | *Wet days* | *mm* | *Wet days* |
| January .... | 61.7 | 10 | 31.2 | 5 |
| February .... | 35.0 | 7 | 0.0 | 0 |
| March .... | 62.0 | 8 | 118.4 | 6 |
| April .... | 60.2 | 11 | 237.5 | 12 |
| May .... | 284.7 | 16 | 187.2 | 13 |
| June .... | 44.7 | 11 | 61.7 | 12 |
| July .... | 33.5 | 8 | 6.4 | 3 |
| August .... | 77.2 | 8 | 156.5 | 23 |
| September .... | 94.7 | 15 | 410.7 | 15 |
| October .... | 224.3 | 15 | 579.4 | 25 |
| November .... | 149.4 | 7 | 194.8 | 19 |
| December .... | 63.5 | 6 | 80.0 | 3 |
| Total .... | 1,190.9 | 122 | 2,063.8 | 136 |

The total nut yield for the year (307,754) was 33.8% less than the 1986 yield and 38.1% less than that of the previous five years' average. An analysis of yield data for the last five years is given in Table 2.4

**Table 2.4**—*Analysis of Yield Data* 1982 *to* 1987—*Bandirippuwa Estate*

| *Pick* | | | *1982* | *1983* | *1984* | *1985* | 1986 | *Five years' average* | *Percent* | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1. | .... | 63,330 | 75,157 | 31,107 | 81,496 | 86,180 | 67,454 | 13.6 | 39,942 |
| | 2. | .... | 86,138 | 126,571 | 57,418 | 105,327 | 112,322 | 97,555 | 19.6 | 63,033 |
| | 3. | .... | 117,120 | 141,571 | 96,823 | 122,662 | 82,023 | 112,040 | 22.6 | 76,837 |
| | 4. | .... | 109,202 | 100,693 | 112,174 | 114,394 | 90,490 | 105,391 | 21.2 | 69,247 |
| | 5. | .... | 63,571 | 56,482 | 62,678 | 93,811 | 56,088 | 66,526 | 13.4 | 39,699 |
| | 6. | .... | 53,853 | 33,878 | 37,766 | 76,116 | 37,534 | 47,829 | 9.6 | 18,996 |
| | | | 493,214 | 534,352 | 397,966 | 593,806 | 464,637 | 496,795 | 100.0 | 307,754 |
| No. of bearing palms | .... | .... | 14,751 | 14,076 | 13,289 | 13,289 | 11,834 | 13,448 | — | 9,940 |
| Yield/palm | .... | .... | 33.4 | 38.0 | 30.0 | 44.7 | 39.3 | 36.9 | — | 31.0 |
| Yield/acre | .... | .... | 2,140 | 2,430 | 1,917 | 2,860 | 2,513 | 2,364 | — | 1,984 |
| Yield/ha | .... | .... | 5,289 | 6,005 | 4,737 | 7,068 | 6,211 | 5,839 | — | 4,901 |

**Table 2.5**—*Disposal of Crop.,—Bandirippuwa Estate*

| | | |
|---|---|---|
| Sold to dealers | .... | 183,792 |
| Converted into copra | .... | 35,634 |
| Issues to resident staff | .... | 58,297 |
| Balance for disposal | .... | 9,741 |
| Rejections | .... | 20,290 |
| Total | .... | 307,754 |

**Field Operations**

(i) **Manuring:** The Adult Palm Mixture was applied as recommended for the bearing palms. Seedlings were manured with the "Young Palm Mixture" at 1 1/2 times the recommended dosage. Organic manure (goat dung) was applied at 35 kg for about 1,500 palms in the Magnesium block. This field was manured with Kieserite at the rate of 1kg per palm.

(ii) **Weed Control:** Weeds were kept under control and the ground conditions were satisfactory.

(iii) **Soil and moisture Conservation:** All existing contour drains were reconditioned. Manure circles were mulched with fallen fronds at regular intervals. Seedlings were mulched twice with coconut fibre dust. Establishement of cover crops in new areas was hampered due to the non-availability of seed material in time. However, the spread of the established covers was fast providing a thick and complete ground cover. All available husks were buried in the estate. Coir dust was used to supplement the shortfall in husks. Sunhemp planted in field No. 1 (Kotakanda) was cut and ploughed in as a soil conditioner. Seeds were collected for further propagation. This land will be planted to coconut by end 1988 only.

(iv) **Fences:** A considerable effort was needed to keep the fences intact as wilful damage was frequent. A concerted effort was made with satisfactory results in establishing a live fence on the perimeter. A total 11,211 fathoms of fence had to be repaired during the year.

(v) **Roads and paths:** The main estate roads and field roads were well maintained (14,064) fathoms). Newly constructed field roads in field Nos. 3, 6, 7 and 8 were consolidated.

(vi) **Replanting:** Five acres in field No. 8 were replanted on 25 ft triangular system with 250 of CRIC–60 and 150 of Ambakelle Special seedlings. Another 8 ac in the same field were prepared for planting in 1988.

Vacancies in field No. 7 (150 Nos.) Ambakelle Special plantation were filled with the seedlings from the Isolated Seed Garden, Ambakelle. Vacancies in other young plantations were filled with CRIC—60 seedlings raised by the estate. Another 1,365 seednuts of CRIC—60 were laid in the pre-nursery, out of which 750 were polybagged by the end of the year. No incidents of pests and diseases were reported.

(**vii**) **Buildings, Machinery etc,:** Vehicles and equipment were satisfactorily maintained. One "Howard 48" Rotaslasher was received during the year. Four hand tractors ("Kubota") and a water pump (Lister 2" Diesel) transferred from Passekudah Farm were repaired and put into use.

Work commenced on the following buildings.

1. Toilet for estate office.
2. Fertilizer stores.
3. Tractor garage.
4. Tool room.
5. Milk room for the dairy.

Progress of work by the contractor had been very slow and the buildings are expected to be completed only in 1988. The Copra kiln was repaired. Other buildings were maintained satisfactorily.

(**viii**) **Cost of production:** The cost of production in 1987 was Rs. 2,805.12 per 1000 nuts produced while the sales average was Rs. 2,449.11 incurring an overall loss. The higher cost of production is due to a variety of reasons such as the unusually large area of non-bearing plantation, higher general charges and overheads (including private security) due to the presence of CRI headquarters in the estate.

**3. Rathmalagara Estate, Madampe**—(Superintendent, Mr. M. R. L. A. Perera)

District — Puttalam
Electorate — Chilaw
Agro-climatic Zone — Semi-dry Intermediate Zone

Excepting for a jungle block of about 8 acres the rest of the plantable land in the estate is under coconut.

**Table 3.1**—*Area Statement, Rathmalagara Estate*

| | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|
| Coconut .... .... | 97.13 | 240 | 0 | 00 |
| Roads & buildings .... | 2.02 | 5 | 0 | 00 |
| Jungle .... .... | 3.24 | 8 | 0 | 00 |
| Waste land .... .... | 8.09 | 20 | 0 | 00 |
| Total .... .... | 110.48 | 273 | 0 | 00 |

Census of palms in relation to field blocks is given in table 3.2. Accordingly the area in bearing is 190 acres.

**Table 3.2**—*Census of Palms, Rathmalagara Estate*

| *Field No.* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | *Total* |
|---|---|---|---|---|---|---|---|---|---|---|
| Total extent (ac) | 28 | 7 | 9 | 52 | 29 | 51 | 57 | 20 | 20 | 273 |
| Bearing extent (ac) | 20 | 6 | 9 | 21 | 16 | 50 | 48 | 8 | 12 | 190 |
| Bearing palms | 1,267 | 338 | 555 | 1,324 | 992 | 3,003 | 2,888 | 475 | 579 | 11,424 |
| Young palms | 2,335 | 523 | 975 | 1,988 | 500 | — | — | 335 | — | 6,656 |
| Dud palms | — | — | — | — | 2 | 8 | 12 | 4 | 8 | 34 |
| Vacancies | — | | — | — | 188 | 353 | 225 | 23 | 146 | 935 |

**Rainfall:** The total rainfall during the year indicates a 24% increase over the previous year but the rainfall distribution was not satisfactory (Table 3.3). Yields in 1988 are expected to be reduced.

**Table 3.3**—*Rainfall* 1986/1987, *Rathmalagara Estate*

| *Year* | | 1986 | | 1987 | |
|---|---|---|---|---|---|
| *Month* | | *mm* | *days* | *mm* | *days* |
| January | .... | 64.8 | 9 | 14.1 | 06 |
| February | .... | 54.3 | 05 | 0 | 00 |
| March | .... | 74.7 | 07 | 72.0 | 04 |
| April | .... | 143.4 | 11 | 120.4 | 10 |
| May | .... | 236.1 | 14 | 141.5 | 12 |
| June | .... | 50.9 | 13 | 65.1 | 10 |
| July | .... | 22.6 | 6 | 16 9 | 06 |
| August | .... | 85.9 | 07 | 139.5 | 17 |
| September | .... | 26.4 | 13 | 190.0 | 17 |
| October | .... | 153.7 | 25 | 526.0 | 22 |
| November | .... | 228.1 | 08 | 196.9 | 18 |
| December | .... | 95.9 | 06 | 53.2 | 08 |
| Total | .... | 1,236.8 | 124 | 1,535.6 | 130 |

**Analysis of yield data:** The yield in 1987 is 27% less than that of 1986 and 17.4% less than the previous five years' average yield (Table 3.4). This can be attributed to the failure of the monsoon in 1986.

**Table 3.4**—*Analysis of Nut Yield Data* 1982 *to* 1987—*Rathmalagara Estate*

| *Pick* | | | 1982 | 1983 | 1984 | 1985 | 1986 | *Five years' average* | *Percent* | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1. | .... | 97,458 | 60,175 | 43,324 | 109,226 | 133,639 | 88,764 | 11.5 | 78,024 |
| | 2. | .... | 143,151 | 133,010 | 80,520 | 109,455 | 157,982 | 124,824 | 16.1 | 114,359 |
| | 3. | .... | 143,880 | 169,948 | 138,295 | 159,840 | 203,283 | 163,049 | 21.0 | 119,910 |
| | 4. | .... | 154,895 | 196,896 | 119,035 | 187,083 | 160,857 | 163,753 | 21.2 | 174,100 |
| | 5. | .... | 142,485 | 108,141 | 121,802 | 220,001 | 127,404 | 143,968 | 18.6 | 94,998 |
| | 6. | .... | 77,401 | 72,455 | 72,417 | 133,945 | 91,678 | 89,579 | 11.6 | 61,590 |
| | Total | .... | 759,270 | 740,625 | 575,393 | 919,556 | 874,843 | 773,937 | 100.0 | 638,981 |
| **Yield/palm** | .... | .... | 66.4 | 71.6 | 57.6 | 79.0 | 75.3 | 70.0 | — | 56.0 |
| **Yield/acre** | .... | .... | 3,996 | 3,898 | 3,028 | 4,840 | 4,604 | 4,073 | — | 3,363 |
| **Yield/ha** | .... | .... | 9,871 | 9,628 | 7,480 | 11,954 | 11,373 | 10,061 | — | 8,307 |

* The figures in the above table were suitably revised to fall in line with the other estates on a uniform system.

**Table 3.5**—*Disposal of Crop, Ratmalagara Estate*

| | | |
|---|---|---|
| Sold to dealers | .... | 322,664 |
| Converted into copra | .... | 54,343 |
| Issues to resident staff | .... | 11,130 |
| Issues to Research Divisions | .... | 1,840 |
| Rejections | .... | 19,016 |
| Lost | .... | 290 |
| Balance undisposed | .... | 229,698 |
| Total | .... | 638,981 |

**Field Operations:**

(i) **Manuring:** The old stand in the underplanted area in field Nos. 1, 2, 3 and 4 was not manured as they are to be uprooted soon. The rest of the adult palms were manured with the Adult Palm Mixture at 3 kg per palm. No magnesium fertilizer was applied as the entire estate was manured with Dolomite at 1 1/2 kg per palm in 1986. Performance of the young plantation in field No. 1 was very poor. This was manured with YPM at 1200 g per seedling during the South West monsoon. In October, semi-circular trenches of 3' wide 2' ft deep with 2 1/2' bottom width were opened 2'. away from the base of each seedling and they were filled with husks with alternating layers of earth mixed with about 15 kg of goat dung. Decaying organic matter available in and around the manure circle too was buried in the same trench. Later the second dose of YPM at 1200 g per seedling was applied within a circle 2' away from the base of the seedlings. These steps were taken as a measure of rehabilitating this plantation. Other young plantations in field No. 4, 5 and 8 were manured twice with 1,200 g of YPM per seedling. At the second application, goat manure was incorporated in shallow trenches at 15 kg per seedling. The young replantations in field No. 2 and 3 were manured with YPM at 600 g per seedling during the May/June season. The second dose of 900 g was split into two and applied at 450 g at the beginning and towards the end of the N/E monsoon.

(ii) **Weed Control:** Weeds were kept well under control and the ground conditions were satisfactory. Depending on the weed growth, each field was weeded in two or three cycles. Tractor drawn implements (Rotaslasher and harrow) were effectively used in controlling weeds. In addition, selective weeding and cheddy weeding were done as required. Herbicides were used to control weeds in manure circles of seedlings as well as adult palms.

(iii) **Soil and moisture conservation:** The husk burying programme was completed as planned. All available husks were buried in 5' x 3' x 3' pits established at 5' away from the base of the palm. Manure circles were mulched with fallen fronds, weed trash etc. in three rounds. Cover cropping programme was not successfull for want of seeds in time. However, it was possible to plant about 12 ac in field Nos. 4, 5 and 8 with *Pureraria* and the old established covers were maintained well. Fibre dust was incorporated by ploughing in one section of the field No. 8. Contour drains in the estate were desilted, reconditioned and maintained in good order.

(iv) **Fences:** Perimeter fence was maintained well. Gliricidia sticks were planted on the southern perimeter to establish a live fence.

(v) **Roads:** Estate roads and paths were maintained well. They were reconditioned only when necessary as funds were restricted. Herbicides were used to keep the roads free of weeds.

(vi) **Replanting** One hundred and thirty five seedlings of (CRIC 60) were planted in about 2 acre in field No. 8. The earlier replanted areas were well maintained and irrigated during dry spells. No incidents of pests and diseases were observed. A pre-nursery was laid in July with 1,500 seednuts of CRIC 60, out of which 1,076 were polybagged. Another pre-nursery was laid with 2,000 seednuts of the same variety in December.

(vii) **Buildings, machinery etc.:** Vehicles (jeep, motor cycle, tractors, trailers, bowsers) and implements were maintained in good order. One tractor was completely overhauled. A grass cutter (Marunaka), knapsack. sprayer (Arimitsu) and two electric water pumps were received. Maintenance of buildings was not very satisfactory. Electricity from the national grid was supplied to the estate. Construction work of a central water scheme is in progress.

(viii) **Costing:** The cost of production had been Rs. 1047/- per 1,000 nuts and the net sales average was Rs. 2,055,57 per 1,000 nuts.

(ix) **Others:** Incidents of thefts of coconuts had been contained with the assistance of the police. Several culprits were convicted at the courts and a few more court cases are pending.

The overall performance of the estate is satisfactory.

**4. Poththukulama Research Station, Pallama**—(Superintendent, Mr. G. Vithanage)

| | | |
|---|---|---|
| District | — | Puttalam |
| Electorate | — | Anamaduwa |
| Agro-climatic Zone | — | Semi-dry Intermediate Zone |

About 65 ac of the estate still remain as an uncleared jungle (Table 4.1). Of the planted extent of 143 ac, only about 120 ac are in bearing.

**Table 4.1**—*Area Statement, Poththukulama Research Station*

| | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|
| Coconut .... .... | 57.81 | 142 | 0 | 17 |
| Paddy .... .... | 1.80 | 4 | 1 | 31 |
| Jungle etc. .... .... | 26.22 | 64 | 3 | 06 |
| Total .... .... | 85.83 | 212 | 3 | 14 |

**Table 4.2** *Census of Palms*

| | | |
|---|---|---|
| Bearing palms | .... | 6,851 |
| Seedlings 2—4 yrs. | .... | 1,251 |
| Seedlings 1—2 yrs. | .... | 223 |
| Dud palms .... | .... | 88 |
| Vacancies .... | .... | 709 |
| Total .... .... | | 9,122 |

**Rainfall:** The total rainfall in 1987 indicates a decrease of 4.0% compared with that of 1986 (Table 4.3) and the distribution of rainfall was very unsatisfactory. This will affect the yields in 1988.

**Table 4.3**—*Rainfall* 1985/1986, *Poththukulama Research Station*

| *Month* | | 1986 *mm* | *days* | 1987 *mm* | *days* |
|---|---|---|---|---|---|
| January | .... | 44.2 | 7 | 24.1 | 03 |
| February | .... | 124.0 | 06 | 0.0 | 00 |
| March | .... | 35.6 | 13 | 13.5 | 01 |
| April | .... | 214.6 | 12 | 208.8 | 11 |
| May | .... | 165.6 | 06 | 120.9 | 07 |
| June | .... | 34.3 | 02 | 80.5 | 06 |
| July | .... | 3.6 | 01 | 0.0 | 00 |
| August | .... | 33.3 | 02 | 40.6 | 05 |
| September | .... | 33.8 | 07 | 172.0 | 10 |
| October | .... | 288.0 | 17 | 323.1 | 20 |
| November | .... | 242.0 | 07 | 115.6 | 09 |
| December | .... | 0.0 | 00 | 70.4 | 05 |
| Total | .... | 1,219.0 | 78 | 1,169.5 | 77 |

**Analysis of yield data:** The total crop in 1987 was 17% more than that of the previous year. This also indicates a 5.4% increase over the previous five years' average yield (Table 4.4) . This is quite contrary to the islandwide general decline in yields.

**Table 4.5**—*Disposal of Crop, Poththukulama Research Station*

| | | |
|---|---|---|
| Sold to dealers .... | .... | 449,183 |
| Converted into copra | .... | 15,984 |
| Issues to resident staff | .... | 5,117 |
| Rejections .... | .... | 16,358 |
| Lost .... | .... | 1,579 |
| Issues to Research Divisions | .... | 1,161 |
| Balance undisposed | .... | 75,960 |
| Total .... | .... | 565,342 |

**Table 4.4**—*Analysis of Nut Yield Data* 1982 *to* 1987

| *Pick* | | *1982* | *1983* | *1984* | *1985* | *1986* | *Five year's. average* | *Percent* | 1987 |
|---|---|---|---|---|---|---|---|---|---|
| | 1. .... | 22,480 | 55,206 | 22,959 | 92,480 | 79,934 | 54,612 | 10.2 | 78,887 |
| | 2. .... | 102,292 | 82,862 | 23,519 | 128,213 | 75,245 | 82,426 | 15.4 | 97,815 |
| | 3. .... | 128,741 | 200,907 | 40,842 | 211,778 | 100,534 | 136,560 | 25.4 | 142,204 |
| | 4. .... | 133,618 | 113,825 | 61,673 | 135,320 | 81,132 | 105,114 | 19.6 | 87,893 |
| | 5. .... | 89,778 | 81,727 | 56,197 | 147,100 | 71,424 | 89,245 | 16.6 | 81,701 |
| | 6. .... | 68,013 | 46,547 | 61,156 | 91,702 | 74,762 | 68,436 | 12.8 | 76,842 |
| | Total .... | 544,922 | 581,074 | 266,346 | 806,593 | 483,031 | 536,393 | 100.0 | 565,342 |
| Yield/palm | .... .... | 83 | 81 | 38 | 111 | 69 | 76 | — | 83 |
| Yield/acre | .... .... | 4,541 | 4,842 | 2,220 | 6,722 | 4,025 | 4,470 | — | 4,711 |
| Yield/ha | .... .... | 11,216 | 11,960 | 5,482 | 16,602 | 9,942 | 11,041 | — | 11,637 |

* The figures in the above table were suitably revised to fall in line with the other estates on a uniform system.

**Field Operations and Maintenance**

(i) **Manuring:** The entire mature stand was manured with APM as recommended at 3 kg per palm. Field Nos. 8, 10 and part of 12 were applied with goat manure at 15 kg per palm for 1,263 palms.

Seedlings were manured as recommended with YPM

(ii) **Weed control:** The entire cultivated area was weeded four rounds during the year and the ground conditions remained very satisfactory. 'Illuk' was contained effectively in 45 ac by manual removal after harrowing. Establishment of cover crops reduced the recurrence of 'Illuk' in such fields. Herbicides were effectively used on manure circles and roadsides.

(iii) **Soil and moisture conservation:** All available husks were buried in 584 pits of 8' x 4' x 3' and 396 pits of 5' x 3' x 3'. Manure circles were mulched with fallen fronds etc. in three cycles. Cover cropping was successfully done in 30 ac and the old established covers spread out satisfactorily. Contour drains (287 fathoms) were desilted, reconditioned and maintained in good order. Two hundred and sixty nine fathoms of new drains were opened and maintained.

(iv) **Fences:** Perimeter fence of the estate was maintained in good order. Nearly 2,500 fathoms of fence were cleaned and 460 fathoms were renovated.

(v) **Roads:** Estate roads and paths were well maintained. Nearly 1,000 fathoms of road were reconditioned by surfacing with gravel and 220 fathoms of new road were opened up as boundary roads in Blocks 2 and 3. Seven culverts were constructed in the process. Herbicides were used effectively to maintain weed-free roads.

(vi) **Improvements to the plantation:** Two hundred and eight dud palms were uprooted and removed. Holes of 4' x 4' x 4' were opened in those places for infilling. The King coconut block which is performing very poorly was prepared for replanting in 1988 with CRIC 60 seedlings.

A pre-nursery was laid in June with 1,000 CRIC 60 seednuts. Seedlings were transferred to polybags and they developed into excellent seedlings receiving commendations from visitors, as the first-ever quality polybagged seedlings produced by the CRI.

The abandoned paddy field which was cultivated after several years in 1986 was re-cultivated for the second year in succession. The first years' crop was 150 bushels and it is expected to produce better results this season.

A reservoir of about 1/2 acre in extent was built in the upper reaches of the paddy field by constructing a bund, across a natural water course. This became very useful for the paddy field in maintaining sufficient moisture levels. The reservoir will be further improved during the following year.

A low-lying 3-acre vacant plot in field No. 11-B was planted with 500 suckers of banana. Crop growth is satisfactory and good yields are expected in mid—1988.

(**vii**) **Building, machinery etc,:** Buildings were colour-washed and maintained effecting minor repairs locally. However, two buildings need major repairs.

Machinery and equipment on the estate were maintained in good order. An old MF-135 tractor was overhauled by the agents and a new Ford tractor and a trailer were supplied. A knapsack sprayer and a grass cutter (Rotaslasher) were provided.

Instead of laying a pipeline from the main overhead tank, a tube well was constructed to supply water to the newly constructed watcher's quarters. This was unsuccessful due to poor quality water and pump failure.

(**viii**) **Costing:** Cost of production was Rs. 849.00 per 1,000 nuts and the net sales average was Rs. 2,146.41 per 1,000 nuts.

(**ix**) **Others:** A considerable damage, estimated at about 30,000 nuts per year, is caused by monkeys. Overall performance of the estate is very satisfactory.

**5. Walpita Estate, Walpita**—(Officer-in-charge: Mr. M. Sisira Perera)

| | | |
|---|---|---|
| District | — | Gampaha |
| Electorate | — | Divulapitiya |
| Agro-climatic Zone | — | Wet Zone |

This is a small property of 44 acres in extent established in 1948 as a Progeny Trial. Area under coconut is 40 acres (Table 5.1). Most of the intercropping trials and demonstrations of the Agronomy Division are conducted here.

**Table 5.1**—*Area Statement, Walpita Estate*

| | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|
| Coconut .... .... | 16.19 | 40 | 0 | 00 |
| Buildings etc. .... .... | 1.62 | 4 | 0 | 00 |
| Total .... .... | 17.81 | 44 | 0 | 00 |

**Census of palms:** According to the census 82% of this plantation is in bearing (Table 5.2)

**Table 5.2** *Census of Palms, Walpita, Estate*

| | |
|---|---|
| Bearing palms .... .... | 2,099 |
| Young palms .... .... | 383 |
| Dud palms .... .... | 59 |
| Vacancies .... .... | 28 |
| Total .... .... | 2,569 |

**Rainfall:** The total rainfall for the year was 2,231 mm with 123 wet days. This is 429 mm (24%) more than that of 1986 (Table 5.3).

**Table 5.3**—*Rainfall* 1986—1987, *Walpita Estate*

| *Month* | | 1986 *mm* | *days* | 1987 *mm* | *days* |
|---|---|---|---|---|---|
| January | .... | 113.4 | 9 | 20.3 | 3 |
| February | .... | 58.3 | 5 | — | — |
| March | .... | 80.1 | 8 | 20.9 | 5 |
| April | .... | 220.7 | 11 | 304.5 | 12 |
| May | .... | 242.0 | 15 | 250.6 | 12 |
| June | .... | 97.7 | 15 | 205.6 | 14 |
| July | .... | 36.6 | 11 | 12.9 | 4 |
| August | .... | 98.1 | 7 | 198.8 | 22 |
| September | .... | 154.5 | 20 | 205.0 | 12 |
| October | .... | 300.3 | 19 | 658.4 | 20 |
| November | .... | 325.4 | 9 | 293.5 | 15 |
| December | .... | 74.6 | 7 | 60.5 | 4 |
| Total | .... | 1,801.7 | 126 | 2,231.0 | 123 |

**Analysis of yield data:** The crop in 1987 is 8.8% less than that of 1986 but 5.1% more than the previous five years' average yield (Table 5.4).

**Table 5.4**—*Analysis of Yield Data* 1982 *to* 1987, *Walpita Estate*

| *Pick* | | | 1982 | 1983 | 1984 | 1985 | 1986 | *Five years' average* | *Percent* | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1. | .... | 16,139 | 9,809 | 5,408 | 17,926 | 20,843 | 14,025 | 8.6 | 16,958 |
| | 2. | .... | 33,757 | 28,955 | 11,032 | 24,116 | 24,741 | 24,520 | 14.9 | 47,925 |
| | 3. | .... | 41,421 | 36,024 | 24,040 | 58,925 | 43,911 | 40,862 | 24.9 | 44,643 |
| | 4. | .... | 42,655 | 30,775 | 33,704 | 43,722 | 48,049 | 39,781 | 24.3 | 33,634 |
| | 5. | .... | 31,349 | 17,887 | 25,854 | 40,291 | 33,114 | 26,699 | 18.1 | 22,092 |
| | 6. | .... | 11,964 | 7,627 | 8,623 | 28,943 | 18,337 | 15,099 | 9.2 | 7,074 |
| | | Total .... | 177,285 | 131,067 | 108,661 | 213,923 | 188,995 | 163,986 | 100.0 | 172,326 |
| Yield/palm | .... | .... | 82.2 | 60.8 | 50.4 | 99.2 | 87.6 | 76.0 | — | 82.1 |
| Yield/ac | .... | .... | 4,432 | 3,276 | 2,721 | 5,348 | 4,724 | 4,100 | — | 4,308 |
| Yield/ha | .... | .... | 10,947 | 8,092 | 6,721 | 13,210 | 11,668 | 10,127 | — | 10,641 |

* The figures in the above table were suitably revised to fall in line with the other estates on a uniform system.

**Disposal of crop:** Crop was disposed mainly as fresh nuts through brokers and only the buyers' rejections were converted into copra resulting a poor out-turn (Table 5.5).

**Table 5.5** *Disposal of Crop, Walpita Estate*

| | | |
|---|---|---|
| Sold to dealers .... | .... | 144,127 |
| Issues to resident staff | .... | 2,352 |
| Converted into copra | .... | 13,266 |
| Rejections .... | .... | 6,401 |
| Balance undisposed | .... | 6,180 |
| Total .... | .... | 172,326 |

**Field Operation**

**Manuring:** As recommended, the adult palms were fertilized with APM at 4 1/2 kg per palm in Maha season and the seedlings (infills) were fertilized with YPM, applied in two split doses.

(ii) **Weed control:** Ground conditions remained satisfactory with the weeds well under control. Three rounds of weeding by uprooting and slashing had been done during the year.

(iii) **Soil and moisture coservation:** Nearly 2,000 m of contour drains in block 'B' were reconditioned. All available husks were buried in Block 'A' in 737 pits 5' x 3' x 3'. Cover crops were newly established in 16 ac and the old covers were well maintained. Mulching of manure circles was done regularly with fallen fronds. Seedlings were mulched with husks.

(iv) **Fences:** The boundary fence was maintained in good order. Gliricidia sticks were planted at 2' intervals along the boundary to establish live fence. In addition a large number of timber trees (mahogany, teak) were planted along the perimeter. Boundary fence was cleaned three times during the year.

(v) **Roads:** Field roads were maintained free of weeds by using herbicides. A new boundary road was opened in a section of block B. The main estate road was improved by constructing a culvert and resurfacing the road with gravel.

(vi) **Buildings, machinery etc,:** Buildings were maintained in good order. A building was constructed to install the new generator, All distribution lines were done by underground cables to save the plantation. A new pedal cycle, grass cutter, water pump and a calculator were supplied. The motor cycle was sent for a complete overhaul and a reconditioned one was supplied.

(vii) **Costing:** The cost of production was Rs. 1,096.48 per 1,000 nuts. and the sales average was Rs. 2,256.65 per 1,000 nuts.

## 6. Kirimetiyana Estate, Lunuwila—(Officer-in-charge, Mr. K. P. C. Fernando)

District — Puttalam
Electorate — Wennappuwa
Agro-climatic Zone — Semi-wet Intermediate Zone

This is a property owned by the Land Reforms Commission and managed by the CRI on a lease basis. No development had been done due to the uncertainity of ownership. Consequently a major part of the estate is in a neglected state with a senile plantation.

**Table 6.1**—*Area Statement, Kirimetiyana Estate*

| | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|
| Coconut .... .... | 16.19 | 40 | 0 | 00 |
| Buildings, bare land etc. .... | 22.26 | 55 | 0 | 00 |
| Total .... .... | 38.45 | 95 | 0 | 00 |

**Census of Palms:** No proper census of palms had been taken for the year due to the neglected condition of the estate. However, the number of bearing palms is 1536.

**Rainfall:** Rainfall figures are the same as those of Bandirippuwa Estate (Table 2.3)

**Analysis of yield data:** Comparative yield data are not prepared as it has no relevance due to the neglected state and the unevenness of the plantation. However the yields in 1986 and 1987 are given in Table 6.2

**Table 6.2**—*Yield data for* 1986 *and* 1987, *Kirimetiyana Estate*

| *Pick* | 1986 | 1987 |
|---|---|---|
| 1 .... .... | 2,698 | 2,987 |
| 2 .... .... | 5,040 | 4,114 |
| 3 .... .... | 5,068 | 4,280 |
| 4 .... .... | 4,750 | 2,947 |
| 5 .... .... | 3,017 | 1,258 |
| 6 .... .... | 2,004 | 592 |
| Total .... | 22,577 | 16,718 |

There is a 26 % drop in yield compared with the year 1986. This could be attributed to,

(a) drought conditions in 1986

(b) progressive removal of the old stand towards the latter part of the year.

**Crop disposal:**

**Table 6.3**—*Crop disposal*

| | | | |
|---|---|---|---|
| Sold to dealers | .... | .... | 10,972 |
| Issues to resident staff | | .... | 4,372 |
| Rejections | .... | .... | 1,374 |
| Total | .... | .... | 16,718 |

**Field operations:** Only the minimum maintenance operations had been done to keep the plantation tidy.

7. **Makandura Seed Garden**—(Officer-in-charge, Mr. J. I. Jayalath)

| | | |
|---|---|---|
| District | .... | Kurunegala |
| Electorate | .... | Katugampola |
| Agro-climatic Zone | .... | Semi-wet Intermediate Zone |

This seed garden was established with the financial assistance of the Coconut Development Project (funded by the Asian Development Bank and the International Fund for Agricultural Development). The entire plantable area in the Seed Garden is now put under coconut (Table 7.1).

**Table 7.1**—*Area Statement, Makandura Seed Garden*

| | | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|---|
| Coconut .... | .... | 53.83 | 133 | 0 | 00 |
| Roads and buildings | .... | 2.02 | 5 | 0 | 00 |
| Wasteland/reservoir | .... | 2.43 | 6 | 0 | 00 |
| Total .... | .... | 58.28 | 144 | 0 | 00 |

The Seed Garden is planted to CRIC 60 and Ambakelle Special. Planting details are given in Table 7.2.

**Table 7.2**—*Planting details, Makandura Seed Garden*

| *Field No.* | | *Extent (AC)* | *No. of Seedlings* | *Spacing (m) and System* | *Material* | *Planted in* | |
|---|---|---|---|---|---|---|---|
| 1. | .... | 17.1 | 1,270 | 8. equilateral triangular | CRIC 60 | September, | 1984 |
| 1. | .... | 15.0 | 1,068 | —do— | —do— | June, | 1985 |
| 2. | .... | 23.4 | 1,735 | —do— | —do— | November, | 1984 |
| 2. | .... | 18.8 | 1,392 | —do— | —do— | May, | 1985 |
| 3. | .... | 13.2 | 1,057 | 7.6 equilateral triangular | "Ambakele Special" | May, | 1984 |
| 3. | .... | 3.5 | 280 | —do— | CRIC 60 | May, | 1984 |
| 3. | .... | 11.0 | 884 | —do— | —do— | May, | 1985 |
| 4. | .... | 25.9 | 2,073 | —do— | —do— | July, | 1984 |
| 4. | .... | 5.1 | 408 | —do— | —do— | May, | 1985 |
| Unplanted | .... | 11.0 | — | | | | |
| Total | .... | 144.0 | 10,167 | | | | |

**Rainfall:** Total rainfall for 1987 indicates a 36.5% increase over 1986. However, the distribution of the same was not very satisfactory (Table 7.3)

**Table 7.3**—*Rainfall* 1986 *and* 1987 , *Makandura Seed Garden*

| | | 1986 | | 1987 | |
|---|---|---|---|---|---|
| *Month* | | *mm* | *days* | *mm* | *days* |
| January | .... | 86.1 | 9 | 42.9 | 4 |
| February | .... | 34.1 | 4 | — | — |
| March | .... | 32.1 | 6 | 70.1 | 3 |
| April | .... | 83.4 | 10 | 238.1 | 9 |
| May | .... | 271.1 | 13 | 88.5 | 8 |
| June | .... | 46.3 | 9 | 142.8 | 13 |
| July | .... | 29.9 | 6 | 4.2 | 1 |
| August | .... | 115.9 | 8 | 157.9 | 19 |
| September | .... | 113.8 | 17 | 289.1 | 12 |
| October | .... | 264.7 | 20 | 576.0 | 18 |
| November | .... | 354.3 | 8 | 348.4 | 17 |
| December | .... | 80.4 | 4 | 105.2 | 6 |
| Total | .... | 1,512.1 | 114 | 2,063.2 | 110 |

Drought conditions prevailed during the early part of the year and in the latter part the rains were very heavy, causing water-logged conditions in the seed garden. This had affected the growth of about 300 seedlings and finally 50 of them died due to water-logging.

**Field operations**

(i) **Manuring:** YPM was applied at 1 1/2 times the recommeneded dose in two applications as the weather conditions did not permit the application is four spilt doses. Arrangements made for organic manuring did not materialise due to the delay in supplies. Application of dolomite was confined to seed garden proper and the barrier area will be applied in the following year.

(ii) **Weed control:** Three rounds of weeding had been done during the year (25 808 squares). In addition, the 'Rotaslasher' was used in three rounds (99 days) and the weeds were kept well under control.

(iii) **Soil and moisture conservation:** Existing contour drains were desilted and reconditioned. Cover crops (Pueraria) were newly planted in 18 ac and the existing cover crop was maintained well. Coir dust was buried in 1,000 pits 5' x 3' x 3' in size. Manure circles of the seedlings were mulched twice during the year.

(iv) **Fences:** Boundary fence was cleaned (5,028 fathoms x 3 rounds) and maintained in good order. Live fencing with Gliricidia stakes was attempted in a small section with success.

(v) **Roads and paths:** All major roads were weeded one to five times as required and maintained in good order.

(vi) **Others:** Nearly 3,000 ft³ of anthills were dug out and removed. Metal tags giving the identification number were fixed to 6,415 seedlings. A reservoir of one hectare in extent was constructed in field No. 1. Entire surface run-off the Seed Garden is diverted to the reservoir by means of a channel system. Subsequently, the tank bunds were turfed with a suitable type of grass. A few seedlings were destroyed due to these constructions. The main entrance was widened and a new gate was installed.

All the labour families excepting one, all of whom belong to the Coconut Cultivation Board (CCB) but were living within the Seed Garden, had been removed by the CCB.

Three seedlings as described below had come into flower.

| *Field No.* | *Seedling No.* | *Variety* | *Date flowered* | *Age at flowering* |
|---|---|---|---|---|
| 1 .... | 1181 | CRIC 60 | 87-11-15 | 3yr. 2 mon. |
| 3 .... | 442 | 'Ambakelle Special" | 87-11-30 | 3yr. 6 mon. |
| 3 .... | 811 | —do— | 87-12-05 | 3yr. 7 mon. |

(vii) **Buildings and machinery:** David Brown tractor (37 Sri 1853) was sent to the agents for an engine overhaul. Other tractor, trailers and equipment were maintained in good order. Another new water bowser (46 Sri 1292) was supplied to the seed garden.

The motor cycle (YAMAHA/ENDURO 85 Sri 8563) was transferred to Genetics and Plant Breeding Division and a new Honda CD - 200 motor cycle (94 Sri 8976) was received on 20 January.

Newly constructed office building and the grade IV quarters were taken over from the contractors and are now occupied. Work on grade II quarters (4 Nos.) is complete but the buildings are not yet taken over from the contractor.

Mains electricity supply was provided to the seed garden this year.

Two tube wells were drilled. One well has an excellent output so that it can be tapped continuously without using a deep-well pump.

Two electric (3-phase) water pumps were issued to the seed garden.

**8. Maduru Oya Seed Garden, Bogaswewa, Dimbulagala**—(Superintendent, Mr. S. M. Wijeratne Banda)

District — Polonnaruwa
Electorate — Polonnaruwa
Agro-climatic Zone — Dry Zone

This seed garden was established under the East Coast Rehabilitation Project of the Coconut Development Authority, financed by the European Economic Community and will produce CRIC - 60 seednuts.

Work on the seed garden commenced in the latter part of 1985. Eighty acres were planted by end 1987.

**Table 8.1**—*Area Statement, Maduru Oya Seed Garden*

| | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|
| Coconut planted .... | 32.40 | 80 | 0 | 00 |
| Unplanted .... | 28.35 | 70 | 0 | 00 |
| Jungle .... .... | 20.25 | 50 | 0 | 00 |
| Buildings etc. .... | 4.05 | 10 | 0 | 00 |
| Total .... .... | 85.05 | 210 | 0 | 00 |

**Rainfall:** Rainfall records were not available till 1986. However, in 1987 the seed garden experienced a below-normal rainfall but with a distribution typical of dry zone (Table 8.2).

**Table 8.2**—*Rainfall* 1987—*Maduru Oya Seed Garden*

| *Month* | *mm* | *days* |
|---|---|---|
| January .... .... | 242.6 | 13 |
| February .... .... | 24.1 | 2 |
| March .... .... | 11.4 | 1 |
| April .... .... | 36.3 | 4 |
| May .... .... | 125.2 | 5 |
| June .... .... | — | — |
| July .... .... | — | — |
| August .... .... | — | — |
| September .... .... | 146.0 | 9 |
| October .... .... | 195.6 | 13 |
| November .... .... | 101.6 | 8 |
| December .... .... | 56.0 | 6 |
| Total .... .... | 938.8 | 61 |

**Activities:**

(i) **New planting:** Another 20 ac were planted with CRIC-60 on 7.6 m equilateral triangular system making the total planted area 80 ac.

(ii) **Manuring:** YPM was applied at 1 1/2 times the recommended amount in two split doses.

(iii) **Weed control:** Weeds were kept satisfactorily under control.

(iv) **Soil and moisture conservation:** About 1,000 fathoms of contour drains were desilted in field Nos. 1, 2 and 3. Natural drainage canals (767 fathoms) were cleared. Cover crops were established in another 30 ac. Seedlings were mulched two rounds with dry salvinia. Watering was done during the drought season.

(v) **Fences:** Boundary fence was maintained in good order. A concrete fence of over 1,250 fathoms was erected on the perimeter.

(vi) **Roads:** The estate roads and paths were maintained satisfactorily.

(vii) **Pests and diseases:** Recommended preventive measures were taken. No incidents of pests and diseases were recorded.

(viii) **Nursery:** A pre-nursery was laid with 10,000 seednuts of CRIC 60, out of which 7,000 germinated nuts were polybagged.

(ix) **Elephant damage:** Visitation of wild elephants was reduced owing to the habitation and cultivation of surrounding lands and paddy fields. No serious damage was caused due to strict vigilance and timely action taken by the staff. Thirty five acres of jungle area was underbrushed to discourage wild elephants using it as a hiding ground.

(x) **Vehicles, machinery etc. :** All vehicles, machinery and equipment were maintained in good order. A motor cycle (HONDA CD - 200) was supplied to the station. The office was provided with two typewriters (one Sinhalese and one English) and a writing table.

(xi) **Buildings:** Only two of the Grade II quarters are available and they were maintained in good order. Rest of the building programme was not completed yet on account of difficulties faced with the contractors.

**9. Minneriya Research and Demonstration Farm, Minneriya,—**
(Officer-in-charge Mr. M. P. W. Fernando)

District — Polonnaruwa
Electorate — Polonnaruwa
Agro-climatic Zone — Dry Zone

**Table 9.1—Area Statement**

| | *Hectares* | *Acres* |
|---|---|---|
| Planted .... .... | 13.36 | 33 |
| Cleared area .... .... | 2.02 | 5 |
| Uncleared area .... .... | 35.21 | 87 |
| Total .... .... | 50.59 | 125 |

**Table 9.2**—*Census of Palms*

| | *Field No.* 1 | *Field No.* 2 | *Total* |
|---|---|---|---|
| Ordinary Tall .... | 24 | — | 24 |
| CRIC 60 .... | 241 | 1,900 | 2,141 |
| CRIC 65 .... | 239 | — | 239 |
| Moorock Tall .... | 224 | — | 224 |
| Dwarf Red .... | 15 | — | 15 |
| Total .... | 743 | 1,900 | 2643 |

**Table 9.3**—*Details of Bearing Palms*

| *Field* | *Variety* | *Flowering* | *Bearing* |
|---|---|---|---|
| 1 .... | CRIC - 65 | 26 | 7 |
| 1 | Dwarf red | 8 | 2 |
| Total .... | | 34 | 9 |

**Rainfall:** The farm received an average rainfall with the typical bimodal distribution (Table 9.4).

**Table 9.4**—*Rainfall* 1987—*Minneriya Farm*

| *Month* | *mm* | *days* |
|---|---|---|
| January | 203.2 | 6 |
| February | — | — |
| March | — | — |
| April | 170.2 | 8 |
| May | 101.6 | 4 |
| June | — | — |
| July | — | — |
| August | — | — |
| September | 109.2 | 4 |
| October | 304.8 | 9 |
| November | 317.5 | 7 |
| December | 165.1 | 5 |
| Total | 1,371.6 | 43 |

**Activities:**

(i) **New planting:** About 11 ac (900 seedlings) were planted with CRIC 60 in field No. 2 on 25 ft. equilateral triangular system.

(ii) **Manuring:** Flowering/bearing palms were manured with APM at 3 kg in a single application. YPM was applied to other seedlings as per recommendations.

(iii) **Weed control:** Planted extent (33 ac) was weeded. for two rounds. Ground conditions were satisfactorily maintained.

(iv) **Soil and moisture conservation:** Contour drains were opened in newly planted area. Cover crop (*Puereria phaseoloides*) was planted in newly planted areas. Seedlings were mulched with available material such as paddy straw, weed trash etc.

(v) **Irrigation:** Seedlings were irrigated during the dry spells at about 60 l per week per seedling. There was no visible setback to the seedlings due to the drought.

(vi) **Fences:** Boundary fence was frequently damaged by wild elephants. However, it was regularly repaired and kept in good order.

(vii) **Roads:** All estate roads (about 3 km) were cleaned and maintained well.

(viii) **Pests and diseases:** Recommended preventive measures were taken. No incidents of pests and diseases were recorded.

(ix) **Wind barrier:** Wind barriers were established with 2,000 eucalyptus seedlings (double rows of 1.5 m triangular once every 10 rows of coconuts).

(x) **Elephant damage:** Wild elephants continued to visit but the damage was very minimal.

(xi) **Vehicle, machinery, buildings etc.:** The jeep, tractors and other implements were maintained in good order. All the buildings were maintained well.

**10. Passekudah Research and Demonstration Farm, Kalkudah—**
(Officer-in-charge, Mr. A. Thavaratnarajah/Asst. Farm Manager)

District — Batticaloa

Electorate — Kalkudah

Agroclimatic Zone — Dry Zone

**Table 10.1**—*Area Statement*

| | *Hectares* | *A* | *R* | *P* |
|---|---|---|---|---|
| Evaluation of cultivars .... | 2.43 | 6 | 0 | 00 |
| Irrigation trial .... .... | 1.82 | 4 | 2 | 00 |
| Shade cropping and mulching trial .... | 0.91 | 2 | 1 | 00 |
| Drought tolerance trial .... | 2.02 | 5 | 0 | 00 |
| Coconut varieties .... | 0.46 | 1 | 0 | 25 |
| Coconut (non-experimental) .... | 24.70 | 61 | 0 | 00 |
| Mango plantation .... | 0.81 | 2 | 0 | 00 |
| Cashew plantation .... | 1.21 | 3 | 0 | 00 |
| Buildings .... .... | 2.02 | 5 | 0 | 00 |
| Rocks .... .... | 1.39 | 3 | 1 | 29 |
| Roadways .... .... | 1.66 | 4 | 0 | 17 |
| Uncultivated .... .... | 7.97 | 19 | 2 | 28 |
| Total .... .... | 47.40 | 117 | 0 | 19 |

**Table 10.2**—*Census of Palms—Passekudah Farm*

| | *Field A* | *Field B* | *Field C* | *Field D* | *Total* |
|---|---|---|---|---|---|
| Bearing .... | 01 | 80 | 119 | 316 | 516 |
| Young palms .... | 241 | 1,544 | 565 | 932 | 3,282 |
| Vacancies .... | 172 | 437 | 90 | 268 | 967 |
| Total .... | 414 | 2,061 | 774 | 1,516 | 4,765 |

**Table 10.3**—*Rainfall* 1986/1987, *Passekudah Farm*

| *Month* | 1986 *mm* | 1986 *days* | 1987 *mm* | 1987 *days* |
|---|---|---|---|---|
| January .... | 442 | 14 | 411.2 | 15 |
| February .... | 154 | 8 | 32.3 | 2 |
| March .... | 266 | 13 | 128.4 | 10 |
| April .... | 22 | 2 | 53.8 | 8 |
| May .... | 26 | 3 | 21.7 | 4 |
| June .... | 0 | 0 | 13.6 | 1 |
| July .... | 58 | 4 | 0 | 0 |
| August .... | 6 | 3 | 23.0 | 3 |
| September .... | 28 | 6 | 98.9 | 9 |
| October .... | 123 | 15 | 331.1 | 16 |
| November .... | 242 | 13 | 141.3 | 14 |
| December .... | 377 | 22 | 59.5 | 7 |
| Total .... | 1,744 | 103 | 1,314.8 | 89 |

**Table 10.4**—*Yield Data*—1987

| *Pick* | *Nuts* |
|---|---|
| 1 .... | 104 |
| 2 .... | 174 |
| 3 .... | 475 |
| 4 .... | 87 |
| 5 .... | Nil |
| 6 .... | Nil |
| Total .... | 840 |

Nuts/palm/yr : 1.6

No nuts were available for harvest during the latter part of the year. Most of the DxT nuts were small and emplty. Hence they were rejected. (Table 10.5)

**Table 10.5**—*Disposal of Crops, Passekudah Farm*

| | | |
|---|---|---|
| Sold locally .... | .... | 305 |
| Issues to resident staff .... | .... | 300 |
| Rejections .... | .... | 235 |
| Total .... | .... | 840 |

**Activities:**

Progress of activities could not be reviewed physically as the farms could not be visited by the officers from Head office due to terrorist activities in the region.

As usual the field operations were kept to a minimum. Manure circles of all palms were weeded once and mulched with the available materials.

Farm was weeded two rounds during the year. Perimeter fence was cleaned once in April and was repaired when necessary.

Manuring was not done as the fertilizer was not available due to the disruption in transport systems.

Red wevil attack and porcupine damages were prevalent.

Manual watering was done during the droughts but with little success.

Samples and necessary data on experiments were collected by the officer in charge and sent to the Head Office.

The two-wheel tractor robbed by the terrorists in 1986 was recovered by the security forces and returned to the Farm in August. Items handed over to Kalkudah Police station for safe keeping were taken back to the Farm.

# REPORT OF THE PROCESSING RESEARCH DIVISION

**Officer-in-Charge—R. Mahindapala, Ph D**

## 1. GENERAL

Research work on processing aspects continued to be on a low-key with attention given only to the ongoing programmes on fibre and kernel products.

Preliminary arrangements were made to initiate a collaborative research programme with the Overseas Development and Natural Resources Institute, England on solar drying of copra. The proposal made on behalf of the government for this collaborative project was accepted in principle by the British authorities and it is expected to commence activities in 1988.

### Staff Matters

Mr. T. K. G. Ranasinghe continued to function as a Consultant.

## 2. RESEARCH PROJECTS

### PROJECT 22—IMPROVEMENTS TO COPRA MANUFACTURING PROCESS WITH FUEL SAVING TECHNIQUES

#### Experiment 22.1—Copra drying and improvements (Sri Lanka Kiln) (1985)

Preliminary trials started in 1986 (Annual Report for 1986) were continued. Four trials were conducted during the year to study the rate of drying of kernel. In these trials, the firing schedule was three fires with the first fire representing the first two fires of the current recommendation, second firing representing the 3rd and 4th firing of the current recommendation and the third firing corresponding to the last three firings of the current method. In these trials, the possibility of reducing the number of shells used in a firing schedule was also studied by using 60%, 70% and 80% of the shells used in the current method.

In each trial the nuts were split and sun-dried. They were then kiln-dried under the new firing schedule using the appropriate amount of shells. At the same time, a similar batch of kernels was dried under the current firing schedule (seven fires) using the appropriate amount of shells. After sun-drying and at the end of each drying cycle, the kernel moisture was estimated by oven-dry method. The temperature of drying kernel was measured hourly just below the surface of kernel layer and at a mid-point of the kernel layer at fire locations (viz. four corners and the centre of the kernel bed).

In the new method of three fires, drying of kernel was insufficient when 60% and 70% of the shells were used. However, when 80% of the shells were used, the moisture content at the end of the third fire was 7.03% (Table) 1).

The trial using 80% of the shells was repeated during the wet season and the drying pattern of kernel was observed to be similar. Table 2 gives temperature fluctuations in the kernel bed.

These experiments demonstrate that the new firing schedule of three fires with 80% of the shells used in the current method could be used to cure copra thus saving on fuel and time. A short fourth fire may be necessary to bring down the moisture in copra to 6%.

*P. A.D. G. A. Appuhamy and A. M. J. C. Wijesinghe*

**Experiment 22.2—Improvements to copra drying through solar dryers (1986)**

A prototype solar dryer was fabricated locally. Field testing of this dryer is in progress.

In the meantime, the Overseas Development and Natural Resources Institute, London was approached to collaborate in the design of a model each for the small holder sector as well as for the estate sector.

## PROJECT 23—COCONUT FIBRE TECHNOLOGY

**Experiment 23.1—Compilation of standards for coir fibre (1985)**

A fibre dust separating machine was installed at Bandirippuwa Estate. Thirty two mattress fibre samples were cleaned for pre-determined periods of time (02, 03 and 04 minutes). The sample weights tested were 0.5 kg., 1.0 kg, 1.5 kg and 2.0 kg. The cleaning machine did not function well when fed with 2.0 kg samples.

The results of this experiment are given in Table 3. The performance of the Fibre Dust separator appears inconsistent as would be seen from the per cent weight loss after cleaning. This is perhaps due to the fact that the fibre separating compartment of the machine could not be fully cleaned before a new sample is introduced thereby allowing an error.

This experiment is in progress in collaboration with the Sri Lanka Standards Institution.

*G. M. R. Karunasekera*

## 3. LECTURES AND SYMPOSIA

Mr. T. K. G. Ranasinghe and Dr. R. Mahindapala participated as resource personnel in the training course conducted for the Diploma in Plantation Management.

**Table 1**—*Moisture content (% by weight) of kernel*

| Sample | 60% *of shell** | | 70% *shell** | | 80% *shell** | |
|---|---|---|---|---|---|---|
| | *Experimental method*** | *Current drying schedule* | *Experimental method*** | *Current drying schedule* | *Experimental method*** | *Current drying schedule* |
| After breaking the nut .... | 39.7 | 39.7 | 41.6 | 41.6 | 39.5 | 39.5 |
| After sun drying .... | 37.5 | 37.5 | 40.4 | 40.4 | 37.4 | 37.4 |
| After 1st fire .... | 26.7 | 28.5 | 34.7 | 25.4 | 22.0 | 20.6 |
| After 2nd fire .... | 18.5 | 18.3 | 17.4 | 21.4 | 10.1 | 19.7 |
| After 3rd fire .... | 11.7 | 13.0 | 7.6 | 11.1 | 7.0 | 8.7 |
| After 4th fire .... | — | 7.2 | — | 8.6 | — | 7.1 |
| After 5th fire .... | — | 6.7 | — | 7.1 | — | 6.9 |
| After 6th fire .... | — | 6.4 | — | 6.4 | — | 4.9 |
| After 7th fire .... | — | 5.8 | — | 6.1 | — | 4.9 |

* Amount of shell of the current recommendation

** Experimental method has only three fires corresponding to the seven fires of the current drying schedule.

**Table 2**—*Variation in mean temperature ($C^0$) just below the kernel layer ($T$) and inside the kernel layer ($t$) using 80% of the shells of the current method (wet season).*

| *Time of the day* | | | *Temperature ($C^0$)* | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | *First firing and cooling* | | *Second firing and cooling* | | *Third firing and cooling* | |
| | | | $T$ | $t$ | $T$ | $t$ | $T$ | $t$ |
| Start | 1600 | .... | 32.0 | 32.0 | 27.5 | 29.0 | 27.0 | 27.0 |
| | 1700 | .... | 53.0 | 36.0 | 56.0 | 43.0 | 52.0 | 39.0 |
| | 1800 | .... | 54.5 | 38.0 | 65.0 | 48.5 | 71.0 | 42.0 |
| | 1900 | .... | 55.5 | 46.5 | 60.0 | 50.5 | 80.5 | 50.0 |
| | 2000 | .... | 59.0 | 45.5 | 66.5 | 56.5 | 81.0 | 67.0 |
| | 2100 | .... | 66.5 | 45.0 | 69.5 | 58.5 | 79.0 | 65.5 |
| | 2200 | .... | 66.0 | 51.0 | 70.5 | 56.0 | 73.0 | 67.0 |
| | 2300 | .... | 61.5 | 48.0 | 72.0 | 60.5 | 75.0 | 65.0 |
| Finish | 0000 | .... | 66.5 | 50.5 | 76.5 | 63.0 | 75.0 | 69.5 |
| | 0100 | .... | 66.0 | 53.5 | 69.5 | 60.5 | 45.0 | 58.5 |
| | 0200 | .... | 66.0 | 55.0 | 65.0 | 61.0 | 40.0 | 46.5 |
| | 0300 | .... | 53.0 | 51.0 | 42.0 | 48.0 | 36.5 | 40.0 |
| | 0400 | .... | 38.5 | 40.5 | 35.0 | 38.0 | 35.0 | 36.0 |

**Table 3**—*Mattress fibre cleaning using Fibre Dust Separator*

| *Cleaning time (min.)* | *Weight of original sample (g)* | *Weight after cleaning (g)* | | | *% Weight loss* |
|---|---|---|---|---|---|
| | | *Mattress fibre* | *Dust & Baby fibre* | *Total* | |
| 02 | 500 | 348.45 | 122.70 | 471.15 | 5.8 |
| 02 | 1,000 | 740.00 | 226.35 | 966.35 | 3.3 |
| 02 | 1,500 | 1,064.90 | 354.05 | 1,418.95 | 5.4 |
| 03 | 500 | 333.56 | 150.33 | 483.89 | 3.2 |
| 03 | 1,000 | 686.58 | 282.99 | 969.57 | 3.0 |
| 03 | 1,500 | 1,041.24 | 417.32 | 1,458.56 | 2.8 |
| 04 | 500 | 316.78 | 162.08 | 478.86 | 4.2 |
| 04 | 1,000 | 675.12 | 274.13 | 949.24 | 5.1 |
| 04 | 1,500 | 983.48 | 440.48 | 1,423.96 | 5.1 |

## REPORT OF THE ADMINISTRATION DIVISION

**Deputy Director (Adm./Finance)—D. N. B. Perera (B.Sc)**

### 1. GENERAL

The division continued to assist the research divisions in routine administrative and financial matters and related affairs, including maintenance work.

**Cadre**

The staff position of the Coconut Research Institute at the end of December, 1987 was as follows:

| | | | | | | *Ungraded* | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Grade* | *Sp. Cl.* | *Cl. I* | *Cl. II* | *Cl. III* | *Cl. IV* | *Sp. Cl.* | *Cl. I* | *Cl. II* | *Total* |
| Executive .... | 03 | 07 | 06 | 26 | 10 | — | — | — | 52 |
| Technical .... | 07 | 16 | 33 | — | — | — | — | — | 56 |
| Intermediate .... | 01 | 01 | 04 | — | — | — | — | — | 06 |
| Clerical .... | 07 | 10 | 35 | — | — | — | — | — | 52 |
| Operative .... | 07 | 14 | 46 | — | — | — | — | — | 67 |
| Minor .... | 38 | 59 | 60 | — | — | — | — | — | 157 |
| **Unclassified** | | | | | | | | | |
| Drivers .... | — | — | — | — | — | 06 | 07 | 28 | 41 |
| Watchers (12hr.) | — | — | — | — | — | — | 20 | — | 20 |
| Total .... | 63 | 107 | 184 | 26 | 10 | 06 | 27 | 28 | 451 |

### 2. PROMOTIONS AND NEW APPOINTMENTS

**Internal Promotions**

Following internal promotions were made for 1985/86 during the year 1987 Unless otherwise stated, the effective date is 01 January of the year indicated.

**A. To Special Class**

**Technical Grade**

(a) Miss S. Periyathamby (S & PND)—1985

**Clerical and Allied Grade**

(a) Mr. D. G. M. Weerasinghe (Accounts Unit)—1985
(b) Mr. P. Premaratne Fernando (Engineering Unit)—1985

**Operative Grade**

(a) Mr. D. W. Hapuarachchi (Information Services Unit)—1985
(b) Mr. K. P. C. Fernando (Estates Management Division)—1985
(c) Mr. A. Albert Fernando (S & PND)—1985

**Drivers Grade**

(a) Mr. W. P. Sirisena (Administration Division)—1985
(b) Mr. D. W. Simon Singho (Administration Division)—1985
(c) Mr. J. A. W. L. Perera (Administration Division)—1985
(d) Mr. K. Swaminathan (Administration Division)—1985

**Minor Grade**

(a) Mr. K. P. A. Fernando (G & PB)—1985
(b) Mr. J. K. H. V. Perera (Estates Management Division)—1986
(c) Mr. W. F. T. Fernando (Accounts Unit)—1986
(d) Mr. W. Sirisena (G & PB)—1985
(e) Mr. J. A. Hubert (G & PB)—1985
(f) Mr. D. M. Sarathchandra (G & PB)—1986
(g) Mr. W. L. Tisera (Information Services Unit)—1986

**B. To Class I**

**Technical Grade**

(a) Mrs. K. P. C. Perera (Agronomy)—1986
(b) Mrs. D. M. D. I. Wijebandara (S & PND)—1986
(c) Mrs. W. B. S. Fernando (G & PB)—1986
(d) Miss M. A. S. Fernando (G & PB)—1986
(e) Mr. D. B. Jayasinghe (CIC)—1986
(f) Mr. M. H. L. Padmasiri (G & PB)—1986
(g) Miss C. K. A. Gamage (Tissue Culture)—1986

**Clerical and Allied Grade**

(a) Mr. A. I. F. Fernando (Administration Division)—1985
(b) Mrs. A. R. S. Hettiarachchi (Accounts Unit)—1985
(c) Mr. Y. H. Wijesena (Accounts Unit)—1986
(d) Mr. A. A. D. N. Athauda (Agronomy Division)—1985
(e) Mr. H. H. J. E. Appuhamy (Estates Management Division)—1986
(f) Mr. R. A. L. C. Fernando (Information Services Unit)—1986

**Operative Grade**

(a) Mr. P. P. Jayasundara (Estates Management Division)—1985
(b) Mr. T. M. W. Pieris (G & PB)—1985
(c) Mr. E. W. A. G. Gunasinghe (Estates Management Division)—1985
(d) Mr. J. Wijedasa (Biometry Unit)—1985
(e) Mr. P. J. C. Fernando (Biometry Unit)—1986

**Drivers Grade**

(a) Mr. K. L. E. J. Appuhamy (Administration Division)—1985
(b) Mr. H. M. Tikiribanda (Administration Division)—1985
(c) Mr. S. A. V. Appuhamy (Administration Division)—1985
(d) Mr. M. A. J. Livera (Administration Division)—1985

**Minor Grade**

(a) Mr. A. M. Abeysena (Administration Division)—1985
(b) Mr. K. M. Sandaratne (Estates Management Division)—1985
(c) Mr. H. P. Karanis (G & PB)—1985
(d) Mr. J. K. C. W. N. Perera (Information Services Unit)—1985
(e) Mrs. M. A. Ghanawathie (Estates Management Division)—1985
(f) Mr. D. W. Jayasena (Engineering Unit)—1985
(g) Mr. R. K. Munasinghe (Engineering Unit)—1985

**C. Executive Grade Promotions**

(a) Dr. R. Mahindapala, Deputy Director (Research) to Executive Grade Special Class with effect from 17 December, 1984.
(b) Dr. (Miss) M. R. T. Wickramaratne, Head/G&PB to Executive Grade Special Class with effect from 19 October, 1986.
(c) Dr. P. Kanagaratnam, Head/CPD, to Executive Grade Class I as Senior Research Officer with effect from 06 September, 1985.
(d) Mr. M. Jeganathan, Head/S & PND; Mr. D. T. Mathes, OIC/Biometry Unit; Mrs. L. V. K. Liyanage, Head/Agronomy; Mrs. S. M. Karunaratne, OIC/ Tissue Culture; to Executive Grade Class I as Senior Research Officers with effect from 10 June, 1987.
(e) Mr. M. de S. Liyanage to Executive Grade Class II as Research Officer with effect from 22 February, 1987.

**Appointments**

Mr. J. L. J. G. Pinto, Assistant Information Officer (Executive Grade Class IV) with effect from 01 June

Mr. P. Daluwatta, Chief Clerk to Personnel Officer (Executive Grade Class IV) with effect from 1 December.

Miss W. S. Renuka Fernando, Clerk/Typist (Clerical and Allied Grade Class II) with effect from 01 October.

Miss W. E. M. Coonghe, was appointed clerk/Typist on transfer from the Coconut Development Authority with effect from 01 October.

**3. RETIREMENTS RESIGNATIONS AND DEATHS**

**Resignations**

Mr. K. P. Jayasinghe, Technical Assistant, Agronomy Division, with effect from 01 January.

Mr. H. Samarasinghe, Technical Assistant, Genetics and Plant Breeding Division, with effect from 12 January.

Mr. J. K. F. Keerthisinghe, Senior Technical Assistant, Crop Protection Division, with effect from 18 January.

Mrs. M. R. P. Sinnathamby, Technical Assistant, Crop Protection Division, with effect from 15 March.

Mr. G. C. Perera, Technical Assistant, Coconut Processing Research Division, with effect from 15 April.

Miss S. N. Weerapperuma, Clerk/Typist, Estates Management Division, with effect from 30 April.

Miss Indu Piyarisi, Library Assistant, Library, with effect from 03 May.

Miss Y. A. N. Samarasinghe, Clerk/Typist, Administration Division, with effect from 18 May.

Mr. S. A. Ariyadasa, Labour, Estates Management Division, with effect from 15 June.

Ms. I. Elvitigala, Technical Assistant, Crop Protection Division, resigned on 17 June on obtaining a transfer to the Coconut Development Authority.

Mr. W. M. K. Premaratne, Tractor Driver, Estates Management Division, with effect from 01 July.

Mr. R. D. H. Appuhamy, Lab/Field Attendant, Genetics and Plant Breeding Division, with effect from 02 July.

Mr. R. D. Dayasena, Clerk, Accounts Division, with effect from 09 July.
Mr. C. de S. Jayasinghe, Clerk/Typist, Accounts Division, with effect from 01 August.

Mr. R. P. Atmon, Watcher, Estates Management Division, with effect from 01 August.

Mr. Michael Dabarera, Watcher, Estates Management Division, with effect from 31 August.

Mr. M. S. Velu, Technical Assistant, Crop Protection Division, with effect from 02 November.

Dr. D. T. Wettasinghe, Director, with effect from 01 December.

Mr. M. D. R. A. M. Senanayake, Administrative Officer, with effect from 01 December.

**Retirements**

Mrs. A. M. Agnas, Labourer, Estates Management Division, with effect from 08 January.

**Deaths**

Mr. A. A. Fernando, Labourer, Coconut Processing Research Division, on 26 January.

Mr. S. D. Abeysekara, Building Caretaker, Engineering Unit, on 11 February.

Mr. V. Sivanandarajah, Experimental Officer, Crop Protection Division, Parasite Breeding Station, Mylambavelly, on 24 February.

**Vacation of Post**

Mr. P. P. M. J. Fernando, Clerk/Typist, Accounts Unit was treated as having vacated his post.

## 4. OVERSEAS/VISITS/TRAINING

| *Name* | *Country Visited* | *Period* | *Purpose* |
|---|---|---|---|
| Mr. M. J. C. Perera | Thailand | 19–31 January | In depth training course on software package for information retrievel and dissemination. |
| Dr. Miss M. R. T. Wickramaratne | Philippines | 26.01.87 to 08.02.87 | Meeting of the Workshop group on Genetic Improvement and familiarization visits |
| Mrs. S. M. Karunaratne | India | 26.02.87 to 02.03.87 | Expert Consultation - Use of plant tissue culture in plant quarantine for exchange of planting materials. |
| Miss T. I. I. Peiris | Malaysia | 20.04.87 to 23.05.87 | Library Automation Systems training |
| Mr. H. A. J. Gunatilake | UK | 03 yrs. from 27.03.87 | Postgraduate Training in Crop Ecology. |
| Mrs. W. M. U. Fernando | Manila Indonesia | 02 weeks from 27.05.87 | International Coconut Breeding Course. |
| Mr. M. de S. Liyanage | Nigeria | 18.09.87 to 16.10.87 | Farming Systems Research and related areas of work |
| Mrs. L. V. K. Liyanage | Costa Rica | 21–27 June 87 | Seminar on "Uses and management of Gliricidia". |

| | | | |
|---|---|---|---|
| Mr. N. A. Tennakoon | Belgium | 01.09.87 to 15.10.87 | Fertilizer and compost techniques. |
| Dr. R. Mahindapala | France & Ivory Coast | 07–21 Nov. 87 | Study tour and familiarization visit. |
| Mrs. S. M. Karunaratne | England | 12–26 Sep.. 87 | Recent Advances in plant Tissue Culture. |
| Mr. K. S. Jayasekara | Italy | 02–25 Nov. 87 | Participation in a College on Soil Physics, and Study Tour. |
| Mrs. L. V. K. Liyanage | Thailand | 01–05 Nov. 87 | Workshop on "Multipurpose Tree species for small farm use." |
| Mr. D. N. S. Fernando | Karachchi Pakistan | 16–19 Nov. 87 | Workshop on Arid and Semi Fuelwood Programme. |

## 5. RECOGNITION OF LONG SERVICE

The following employees, who completed 25 years of service were felicitated and an award was made in recognition of their services.

**Administration Division**

**Establishment Unit**

Messrs J. H. Amarasekera, R. A. Nawatheris Appuhamy, J. E. A. Dalpathado Mrs. H. Fernando, Messrs P. R. Fernandopulle, T. Gunadasa, J. D. Ratnasekera M. A. Somadasa.

**Accounts Unit**

Messrs H. M. Dharmasena, D. M. C. B. Dissanayake, C. de S. Jayasinghe, R. H. B. Silva.

**Engineering Unit**

Messrs S. D. Abeysekera, P. A. P. Appuhamy, R. M. Dayaratne, K. J. M. Fernando, L. D. M. Fernando, P. M. Fernando, K. K. Pabilis Mendis.

**Transport Unit**

Messrs K. L. E. J. Appuhamy, S. A. C. Appuhamy, S. A. F. Appuhamy, W. M. F. Fernando, K. D. Jathiratne, W. A. W. Wijesooriya.

**Information Services Unit**

Messers D. W. Happuarachchi, D. B. Hettiarachchi, M. J. C. Perera, J. L. J. G. Pinto.

**Genetics and Plant Breeding Division**

Messrs R. D. H. Appuhamy, H. Bandappuhamy, A. P. Justin, H. M. Karunadasa, M. P. S. Paris, M. J. P. Perera, W. A M. Rowel.

**Agronomy Division**

Messrs D. Amarasinghe, J. M. J. Jayamanne, P. D. B. Silvan.

**Crop Protection Division**

Messrs J. M. C. E. Appuhamy, D. M. Jayakody, J. K. F. Kirthisinghe, P. A. C. R. Perera, M. Ramasamy, S. M. P. Subasinghe, M. S. Velu.

**Soils and Plant Nutrition Division**

Messrs K. V. W. De Silva, A. A. Fernando, P. M. Harischandra, M. Jeganathan-K. Murugaiah, S. A. Peiris, R. P. Ranbanda, D. S. Wijetunga.

**Biometry Unit**

Messrs A. Dassanayake, E. R. Fernando, U. T. G. Fernando, D. T. Fernandopulle, J. Wijedasa, A. Wilson.

**Coconut Processing Research Division**

Mr. L. W. Theodore.

**Estate Management Division**

Messrs R. K. Amaris Singho, R. P. Edwin Singho, R. P. Etman, K. P. C. Fernando, K. S. L. Fernando, M. R. S. Fernando, Mrs. M. A. Gnanawathie, Mrs. T. M. Gnanawathie, Messrs W. Gunaratne, H. M. Gunatillake, Mrs. P. M. Janenona, Messrs R. Jayasinghe, P. P. Jayasundara, Mrs. H. M. P. Karunawathie, Mrs. R. M. Kumarihamy, Mrs. M. P. Isabel Margeret, Messrs D. M. Pathirage, E. A. Piyadasa, Mrs. T. M. Podimenika, Mrs. G. M. Podinona, Messrs P. P. Ramaiah, D. M. Ratnayake, K. M. Sandaratne, Mrs. S. H. A. M. Somawathie, Mrs. D. M. Subaethana, Messrs H. M. Tikiribanda, P. Ukkubanda. Mrs. K. B. Wimalawathie.

## 6. WELFARE

### A. Financial Aid

**(1) Provident Fund**

The loans from the Provident Fund to employees amounted to Rs. 1,695,351.00.

**(2) Distress Loans**

Distress loans to employees amounted to Rs. 816,409.00.

**(3) Transport Loans**

Transport loans to employees amounted to Rs. 96,000.00

**(4) Loans to Relieve Indebtedness**

Loans to relieve indebtedness to employees amounted to Rs. 703,518.00

## 7. OTHER UNITS OF THE ADMINISTRATION DIVISION

### Transport Section

The Transport Section administered the drivers and upkeep of vehicles. The vehicle fleet at the end of the year was as follows:

| | | | |
|---|---|---|---|
| Cars | 09 | Jeep/Double Cabs | 19 |
| Vans | 03 | Lorries | 06 |
| Buses | 03 | | |
| Purchases during the year | | | |
| Bus | 01 | Cars | 03 |

### Accounts Unit

The General Ledger was fully computerised. The National Institute of Business Management was commissioned to study and report on the working of the unit with a view to introduce improvements.

### Engineering Unit

The Engineering Unit continued to provide maintenance services for the Institute's buildings and other amenities. The civil and other works amounting to rupees two million were undertaken during the year. Several building programmes could not be completed on schedule due to the delays by defaulting contractors. Some of the work undertaken were as follows.

(1) Electrical installation at Soils and Plant Nutrition Division.

(2) Supply, delivery and installation of laboratory furniture for the Agronomy Division.

(3) Renovating the Internal Audit Office.

(4) Construction cubicle for Plant Physiology Unit.

(5) Construction of Overhead Water Tank at Boys Hostel.

(6) Electrical work at Ratmalagara Estate.

(7) Electrical work at Makandura Seed Garden.

(8) Electrical work at Walpita Estate.

(9) Construction of Engineering Unit Office and Workshop at Bandirippuwa Estate.