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Activities of the Coconut Research Institute during 1972

W. R. N. NATHANAEL[1]

Th Coconut Research Board established under Coconut Research Ordinance No. 29 of December 1928 was superseded by a new Board with effect from 1st May 1972. This new Coconut Research Board which was established under Section 58 (1) of the Coconut Development Act No. 46 of 1971 has been assigned the following functions :—

(1) the conducting and furthering of scientific research in respect of the growth and cultivation of coconut palms, the growing of other crops and the engagement in animal husbandry in coconut plantations and the prevention and cure of diseases and pests.

(2) the establishment and maintenance of experimental stations and nurseries.

(3) the conducting and furthering of scientific research in connection with the processing and utilization of coconut products.

(4) the establishment and maintenance of pilot plants for the processing of coconut products and the fabrication of experimental processing equipment.

(5) the training of advisory and extension workers to assist the coconut industry and,

(6) the guiding and advising of the coconut industry on all matters of a technical nature.

The following members (all of whom were nominated by the Minister of Plantation Industries) comprised the first Board set up under this Act :—

Dr. J. Sivapragasam (Chairman)
Mr. A. J. W. Balthazaar
Mr. W. Gunasekera*
Mr. J. W. L. Peiris
Dr. O. S. Peiris
Mr. A. Edmond Perera and
Dr. U. Pethiyagoda

*(Mr. W. Gunasekera resigned from the Board with effect from 1st December 1972 and Mr. P. W. R. de Silva was appointed by the Minister to succeed him).

II. GENERAL

(1) Mr. S. C. Kahawita, B.Com. (Lond.), F.R.Econ.S., Chief Administrative Officer retired from the service of the Institute with effect from 1st January, 1972. He was succeeded by Mr. K. D. J. Wilmot who was subsequently appointed Deputy Director Administration & Finance with effect from 11th April 1970.

[1]Director, Coconut Research Institute, Lunuwila.

(2) Mr. T. T. A. J. C. Samarasinghe, LLB (Cey.) Assistant Administrative Officer resigned from the service of the Institute with effect from 1st January 1972 and Mr. Chandra S. E. Fernando LLB (Cey.) was appointed to succeed him with effect from 17th October 1972.

(3) Mr. M. Jeganathan, B.Sc. (Lond.), M.Phil (Lond.) was promoted Research Assistant with effect from 1st January 1972.

(4) Mr. G. W. M. Wijetunge was promoted Accountant with effect from 26th July 1972.

(5) The following were recruited Research Assistants with effect from 1st November 1972.

Mr. A. S. Amarasinghe, B.Sc. (Agric.) (Ceylon).
Mr. P. Kanagaratnam, B.Sc. (Agric.) (Ceylon).
Mr. S. Mohanadas, B.Sc. (Hons.) (Ceylon).
Mr. B. H. Rohitha, B.Sc. (Ceylon),
Mr. M. P. L. D. Martin, B.Sc. (Agric.) (Ceylon).

(6) Mr. Ananda Senaratne was appointed Engineering Assistant with effect from 16th August 1972.

(7) Mr. D. E. F. Ferdinandez, B.Sc. (Lond.), Officer-in-Charge, Agrostology Division, left for U.K., on 72.09.26 to follow a course of post-graduate studies in Crop Ecology at the University of Wales.

(8) With the exception of Messrs. H. D. M. S. C. Samaranayake and N. T. M. H. de Silva, Research Assistants, the staff attached to the Advisory Division of the Institute was drafted to function under the Coconut Cultivation Board in Colombo, in conformity with the provisions of the Coconut Development Act No. 46 of 1971.

Mr. Samaranayake was transferred to the Planting Division with effect from 15th May 1972 as Assistant Planting Officer (Advisory), and Mr. de Silva was attached to the Division of Agrostology with effect from 2nd May 1972.

(9) Dr. M. A. P. Manthriratne, Botanist, was in addition to his duties appointed Acting Agrostologist with effect from 26th September 1972.

(10) Mr. A. K. Gunapala, Publications Officer resigned from the service of the Institute with effect from 1st July 1972 and Mr. M. J. C. Perera was appointed to act in that post.

(11) The post of Library Assistant was re-designated Librarian with effect from 28th August 1972.

A summary of the activities of the Institute is as follows :—

Soil Chemistry Division

(A) Field Experiments

1. The ten long term field experiments were maintained at Bandirippuwa, Ratmalagara, Pothukulama, Bingiriya, Veyangoda, Dankotuwa and Ratgama.

2. *Effect of Magnesium on Seedlings*

The experimental area was prepared and planted with (1) *tall* × *tall*, (ii) *tall* × *dwarf*, (iii) *dwarf* × *tall* hybrids, and (iv) open pollinated talls.

3. *Effect of Micro-nutrient deficiencies on seedlings symptomology of micro-nutrient deficiencies (Pot Culture Experiment).*

Sand was prepared and the seedlings were planted in August 1972, in connection with this experiment. Field experimental results of interest are :—

(i) At Mawatte Estate, Dankotuwa, absence of sulphur has not produced any adverse effects on the quality of copra.

(ii) Comparison of fertilizer placements (*a*) in entire area round the palm within a radius of 0.5 meter from base, and (*b*) 20 cm × 200 cm strips parallel to rows of palms at 0.5 meter from base, and (*c*) 20 cm × 200 cm strips parallel to rows of mid-point between adjacent palms showed that the best uptake occurred from placement (*a*).

(iii) The two spells of drought experienced during the year have affected the yield of nuts from experimental palms.

(B) Laboratory Investigations

1. Radioactive counts of the samples, from the isotope studies on efficient use of fertilizers by the coconut palms, were concluded.
2. Estimations of nitrogen, phosphorus, potassium, calcium and magnesium in leaf samples from the experiments at Marandawila and Monrovia estates were carried out.
3. Estimations of sulphur in leaf samples from the Boron-Zinc-Sulphur experiment at Monrovia estate were carried out.
4. Estimations of Boron in leaf samples from the Boron-Zinc-Sulphur experiment at Monrovia estate were carried out.
5. Estimations of exchangeable bases, exchangeable potassium, calcium and magnesium, on samples of soil from the experiment on the effect of magnesium on coconut seedlings were carried out. Magnesium extracted by calcium chloride was also determined.
6. Soil samples from model profiles examined during the soil survey of the coconut growing areas were analysed. Total nitrogen and carbon, total exchangeable bases, cation exchange capacity, exchangeable potassium, calcium and magnesium and available phosphorus (sodium bicarbonate extract) were estimated.

Soil Survey

1. Surveys of the Dondagamuwa 1 inch sheet and part of the regional survey of the Kurunegala District were continued.
2. Surveys of an experimental site at Bandirippuwa Estate and portions of the isolation barrier at the Isolated Seed Garden, Ambakelle were conducted.
3. Surveys to determine the suitability of lands for planting coconut were carried out in Agalawatte and Mahiyangana.

Division of Botany and Plant Breeding

1. *Controlled Pollination Work :*

Pollination projects at Bandirippuwa, Ratmalagara, Marandawila, Walpita, Ambakelle, Kiniyama, Andigedera and Achchitotam estates

were maintained. In order to meet the increasing demand for *typica* × *pumila* hybrids, more of this type is being produced in comparison with *typica* × *typica* (prepotent). The number of female flowers pollinated is as follows :—

Typica × *pumila*	111,151
Typica × *typica* (prepotent)	29,018

Hybrid (*pumila* × *typica*) seed is also produced from a 5 acre block of *pumila* palms at the Coconut Seed Garden. 37,076 *typica* × *pumila*, 11,425 *typica* × *typica* seednuts have been harvested from pollinations done in 1971. Eighteen private estates are being assisted to implement their own programmes of controlled pollination and 326 samples of *typica* (prepotent) and 336 samples of *pumila* pollen has been issued to them.

2. *Research Nurseries:*

The undermentioned quantities of hand pollinated seednuts were planted at Bandirippuwa Estate and Ambakelle.

Typica × *typica*	*Typica* × *pumila*	*Pumila* × *typica*
19,542	50,764	9,698

Besides the above, 6,200 dwarf yellow (*eburnea*) and dwarf green (*pumila*) seednuts have been planted as material for the Ambakelle Seed Garden Expansion Project.

This year 27,461 hand pollinated seedlings have been issued consisting of 9,540 *typica* × *typica*, 8,450 *typica* × *pumila* and 9,471 *pumila* × *typica*.

Fifty-one 5 acre Observation plots (each consisting of 2 acres *typica* × *pumila*, 2 acres *pumila* × *typica* and one acre *typica* × *typica*) were established in the Northern, North Central, Southern and Eastern Provinces as co-operative experiments.

A trial to evaluate two different nursery techniques was initiated in the Research Nurseries at Bandirippuwa and Ambakelle.

3. *Mother Palm Seed Supply:*

2,268,416 seednuts were supplied to the Planting Division nurseries. Selection work has been made more difficult due to a shortfall in total crop as well as size of nuts consequent on the effects of drought.

4. *Field Experiments:*

The field experiments and Observation trials at Bandirippuwa (13), Ratmalagara (8), Pothukulama (9), and Walpita were maintained during the year.

Two additional field experiments have been laid down this year, namely, (i) Study of F_2 of *typica* × *pumila* (Bandirippuwa) and (ii) Study of F_1 of *typica* × *nana* (using all three colour forms of *nana*) at Pothukulama.

5. *Isolated Seed Garden, Ambakelle:*

Besides maintaining the 135 acres planted area (Fields 1-9) 50 acres of jungle have been prepared for planting under the Ambakelle Expansion Project for the production of *pumila* × *typica* hybrids. 12 acres have been planted already, and the balance by the end of the year if weather permits. Re-afforestation of the Western isolation barrier could not be completed due to unfavourable weather.

6. *Issues of variety seednuts:*

3,314 seednuts consisting mainly of king coconut and dwarf king coconut have been issued during the year.

7. *Laboratory Investigations:*

(i) An investigation on pollen storage and viability has indicated that pollen stored in an atmosphere of nitrogen maintains viability for periods in excess of those stored at 50% relative humidity. This will be reported in detail in the Annual Report.

(ii) Investigations on parthenocarpy, particularly in the dwarf (*naina*) variety of coconut are being continued.

Dr. M. A. P. Manthriratne, Botanist, visited Ivory Coast on an FAO Fellowship during April/May 1972 to acquaint himself with methods of breeding and selection that are being practised in that country.

Chemistry Division

1. *Study on Diurnal and Seasonal fluctuations of nutrients in Foliar Tissue:*

Ten samplings of foliar tissue at monthly intervals have been carried out during the year in connection with a study on the diurnal and seasonal fluctuations of nutrients in the leaves of *typica* palms that have reached the productive phase.

2. *Study on the Annual Exhaust of Soil Nutrients:*

Commencing from the estate pick for June 1972, at bimonthly intervals a study is being made to estimate the annual removal of the macronutrients (N.P.K. Ca and Mg) by the *adult typica* palm. Plant analyses in connection with this study covered the sampling of fallen fronds, fallen nuts, and the drupes in the first and second clusters.

3. *Size and Weight Characteristics of Hybrid Palm nuts:*

Employing random samples of 150 nuts from *typica* × *pumila* hybrids (from each of the bimonthly picks for 1972), a study has been made to determine size variability and the weight characteristics of the drupe components.

4. *Toddy yields from (T × D) Hybrid Palms:*

Twelve (*typica* × *pumila*) hybrid palms have been tapped for toddy during the year and systematic records are being kept to assess their yield potentialities. The analytical characteristics of the sap are also being studied.

Agrostology Division

1. *Soil Nutrient Studies:*

During the year experiments were set up to study the nutrient status of soils sampled at Kuliyapitiya and Bandirippuwa. The results of these experiments have yet to be analysed.

2. *Pasture Ecology:*

(i) All long-term experiments studying pasture and coconut competition have been managed to schedule and the details and results will be presented in the Annual Report for 1972.

(ii) Experiment (P84) set up at Freds Rhue Estate, Baddegama to study the effect of pasture (under cultivated and uncultivated soil conditions) on palms affected by 'leaf scorch', had to be discontinued as the required degree of co-operation was not extended by the owners of the estate.

(iii) Three experiments on *Brachiaria miliiformis* under coconut were laid down at Kuliyapitiya, Kobeigane and Baddegama representing areas of different rainfall. The dry matter yields and the crude protein contents of the pastures sampled from these experiments are being studied in the laboratory.

(iv) *Subsidiary Crops.*—Preliminary plot trials are in progress to determine the agronomic requirements and performance of Tur dhall, Sunflower, Green gram and Cowpea under mature stands of coconut at Bandirippuwa. The results will be reported elsewhere.

(v) *Microbiological Studies.*—During the year some strains of *Rhizobia* were isolated from the root nodules of the legumes *Calapagonium mucunoides* and *Centrosema pubescens.* Studies on the effectiveness of these organisms on the aforementioned legumes are being pursued.

(vi) *Animal Husbandry.*—The new rotational cross breeding programme of Sinhala with Jersey, Sindhi and Friesian initiated last year is in good progress. The F_1 progeny of (Sinhala × Jersey) has been crossed with Sindhi and so far 24 calves (F_2) have been produced.

A total of 75,839 pints of milk were produced from the herds at Bandirippuwa and Ratmalagara Estates.

Crop Protection Division

1. *Biological Control of Promecotheca cumingi:*

The Biological Control Laboratory established at Havelock Terrace, Havelock Town, Colombo 5, was maintained throughout the year. Mr. Y. Elikewala, Research Officer, Central Agricultural Research Institute continued to function as Officer-in-Charge of the laboratory and Dr. H. E. Fernando, Entomologist, A.R.I., as Leader of the Scientific Term for *Promecotheca* control.

Surveys conducted from October-December 1971 before the liberation of parasites introduced from abroad indicated that apart from a pocket of disease affecting *Promecotheca* larvae in the Kalubowila area, a very low degree of natural parasitization was taking place by the egg parasite *Achrysocaris promecothecae* in certain areas. In the bulk of the 15,000 acres infested survival of *Promecotheca* however was 100%.

The larval and egg parasites *Dimmockia javanica* and *Achrysocaris promecothecae* respectively were introduced from Singapore while the larval and pupal parasite *Pediobius paravulus* was introduced from Fiji. These were bred and multiplied in the Biological Control Laboratory, and releases in the infested areas commenced in December 1971. Since then a total of 130,525 *Dimmockia*, 33,250 *Pediobius* and 123,000 *Achrysocaris* have been liberated in all areas.

Evaluation of the results achieved have shown that *Dimmockia* established rapidly and gave excellent control of the pest. *Pediobius* has consistantly failed to establish in Sri Lanka although it had proved to be

the most effective control for the pest in other parts of the world. *Achrysocaris* continued to give only a low degree of control. Our data prove that *Dimmockia* alone has generally been responsible for over 50% to 75% control of the pest in most areas here. Furthermore there was a rapid increase of naturally (viral, fungal or bacterial disease) occurring control factors following the introduction of *Dimmockia*. We therefore cannot exclude the possibility that probing of *Promecotheca* larval bodies by the swordlike ovipositors of egg-laying *Dimmockia* females caused wounds through which these diseases entered and killed the pest larvae. *Dimmockia* would then be responsible not only for a very high degree of direct control but also indirectly for a portion of the control by natural factors.

A few examples to illustrate the dominent part in control played by *Dimmockia* are mentioned below:—

1. Negombo 100% total control of which 80.6% was by *Dimmockia*.
2. Panagoda 91.3% total control of which 59.8% was by *Dimmockia*.
3. Bangadeniya 100% total control of which 62.5% was by *Dimmockia*.
4. Kandana 88.2% total control of which 52.3% was by *Dimmockia*.
5. Weligama 100% total control of which 77.0% was by *Dimmockia*.

The overall control of *Promecotheca* achieved to date is near complete so much so that it has become difficult to collect *Promecotheca* larvae to maintain even nucleus cultures of *Dimmockia* in the laboratory.

2. *The Coconut Caterpillar:*

The parasite breeding programme for the biological control of the coconut caterpillar—*Nephantis serinopa* Megr., was continued at the Bandirippuwa and Mylambavelly Insectaries.

The breeding of *Nythobia*, *Perisierola* and *Brachymeria* has been stepped up whilst only nuclei cultures of the less effective parasites have been maintained. Very few new infestations of the pest were recorded during the year, and successful control was achieved by the release of parasites in almost all foci of infestation.

Data on the fluctuations of pest densities were collected from five estates in the Eastern Province, six estates in the North Western Province and one estate in the Western Province. An experiment to study the effect of caterpillar attack on coconut yields was started in the Puttalam district during the year.

3. *The Red Weevil:*

Following the long drought that prevailed during the first half of the year, the incidence of this pest has been somewhat on the increase, though no major out-breaks as such have been evident. Some young plantations in the Mahiyangana, Bibile, Moneragala and Udawalawe areas associated with Colonization schemes have been found to be attacked by this pest.

The trap for the red weevil has been used on some estates and subjected to further tests. The breeding of the predator *Platymeris levicollis* was resumed after a lapse of some months and field releases were carried out to study its predatory action under natural conditions.

4. *The Coconut Scale:*

Fresh reports of the coconut scale, *Aspidiotus destructor* were received during the latter part of the year, and in particular infestations were evident in the North Western and Southern provinces.

Research on the breeding of the predator—*Chilocherus nigritus* in the laboratory was continued, and the first stage of this programme concluded successfully.

5. *Rhinoceros Beetle:*

No fresh reports of *Oryctes rhinoceros* were received during the year, and research on this pest was temporarily suspended.

6. *Other Coconut Pests:*

There were no fresh out-breaks of the nettle grub-*Parasa lepida*, the bag worm—*Psyche albipes* or *Soplurops eurystoma.*

Xyleborus similis—This insect was found to attack coconut plantations in the Northern Province, and a certain amount of control was affected with systemic insecticides. Further research is being carried out.

7. *Diseases:*

Very few reports of Bud Rot and Stem Bleeding were received during the year. Research on *Ganoderma* has been initiated, as this has been found in association with coconut palms.

Steps have been taken to despatch samples of plant tissue from palms showing symptoms of 'Leaf Scorch' disorder to Berlin for electron microscopy to detect the presence of Mycoplasma in the phloem elements.

Biometrics Unit

1. *Statistical Work:*

The routine statistical work of the Research Divisions was attended to. Advice was given regarding designs for new experiments.

2. *Agro-Meteorology:*

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

3. *Research:*

(i) *Calibration Trial.*—The Calibration Trial was maintained without interruption.

Arrangements have been made to commence an Irrigation experiment on the Calibration Trial in 1973.

(ii) *High & Low Yielding Palms.*—The study of the distinguishing characters of High and low yielding palms was continued.

(iii) *Optimum Fertilizer Dosage.*—The study on the "Evaluation of Optimum Fertilizer Dosages for coconut in the context of a foreign exchange crisis" was continued.

(iv) *Crop-Forecasting Index.*—(i) A study was made of the relationship between an interim drought index and the production of coconuts in Ceylon. A report giving the crop forecasting function was submitted to the Coconut Authority.

(ii) *Drought Index*—Work was continued towards evolving a more efficient "drought index", because it is felt strongly that a drought index will reflect the reaction of the palm to lack of moisture much better than any precipitation index.

This work will receive attention on a more permanent footing in 1973, when new staff will be recruited for the purpose.

4. *General:*

(i) The Biometrician continued to act as Consultant Biometrician to the Rubber Research Institute of Ceylon.

(ii) The Biometrician gave a course of 20 lectures on "Applied Statistics" to the final year Science Students of the University of Sri Lanka, Vidyodaya Campus.

Planting Division

1. *Seed-nuts:*

The Planting Division maintained 14 nurseries during the year. A total 1,893,436 seed-nuts were laid in the nurseries for seedling issues during the May/June and October/November 1972 seasons as follows:—

Season	*Seed-nuts*
May/June 1972	301,950
October/November 1972	1,591,486
Total	1,893,436

2. *Seedlings:*

Payments were received and orders were issued for the undermentioned quantities of seedlings during the period 1st January to 30th November 1972 :—

Season	*Seedlings*
October/November 1971	76,006
May/June 1972	204,883
October/November 1972	806,620
Total	1,087,509

The position regarding actual issues of seedlings from the fourteen nurseries during the period 1st January to 30th November 1972 was as follows:—

Season	*Seedlings*
October/November 1971	314,019
May/June 1972	168,289
October/November 1972	495,468
Total	977,776

Publications Unit and Library

1. *Journals:*

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

Ceylon Coconut Quarterly

Vol. XXI, Nos. 3/4
Vol. XXII, Nos. 1/2 and 3/4

Ceylon Coconut Planters' Review

Vol. VI, Nos. 2, 3 & 4

Pol Pawath

Vol. IV, No. 4
Vol. V, Nos. 1 & 2

2. *Advisory Leaflets:*

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

Leaflet Nos. 49 and 50 were published in Sinhala during the year.

A Special leaflet on *Promecotheca cumingi* was issued, and this has now been revised to be published as Advisory Leaflet No. 52 in all three languages.

3. *Library:*

120 new books have been added to the library making a total of 3,100. Subscriptions have been paid for 7 new Journals making a total of 152. In addition to these 190 Journals are being received in exchange for CRI publications.

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