Ceylon Cocon. Plrs. Rev. (1971), 6, 113-122

Activities of the Coconut Research Institute during 1970

DR. W. R. N. NATHANAEL[1]

GENERAL

1. Dr. D. A. Nethsinghe, Soil Chemist, who was released by the Coconut Research Board to take up an assignment with the International Atomic Energy Agency, Vienna in 1966, resigned from the service of the Institute with effect from 31st July 1970.

Mr. T. S. Balakrishnamurti, Acting Soil Chemist, continued to be in charge of the Soil Chemistry Division throughout the year.

2. Mrs. N. Rajaratnam, Research Assistant, Agrostology Division resigned from her post with effect from 1st September 1970 to settle down in the United Kingdom.

Mr. D. E. F. Ferdinandez was appointed Officer-in-Charge of the Division from the date of Mrs. Rajaratnam's resignation.

3. Mr. A. K. Gunapala, Publications Officer was awarded a Colombo Plan Scholarship to follow a course of training in Agricultural Journalism in U.K. Mr. Gunapala left Ceylon on 29th April 1970 and returned on 1st September 1970 after successfully completing his studies. He was awarded a certificate by the Central Office of Information, London in respect of the course he followed on "the Organisation and Techniques of Official Information Services".

4. Mr. M. Jeganathan, Senior Technical Assistant, Chemistry Division was awarded a Colombo Plan Scholarship to follow a course of training in Plant Chemistry at the East Malling Research Station in U.K. Mr. Jeganathan left Ceylon on 11th March 1970, and during the course of the year was registered for the M.Phil. Degree. He is due to submit his thesis to London University in March 1971, and has been reported by the authorities to be making good progress.

5. In response to an application made under the Colombo Plan for a Consultant Plant Physiologist, the services of Dr. E. C. Humphries of Rothamsted Experimental Station were made available during the period 16th January to 11th February to "Advise on future lines of work on the Leaf Scorch Decline of Coconut, from the physiological angle".

Based on the observations and recommendations made by Dr. Humphries in his report, certain studies and experiments were initiated by the Crop Protection Officer and Agrostologist during the course of the year.

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

1. Director, Coconut Research Institute, Ceylon.

I. SOIL CHEMISTRY DIVISION

A. FIELD EXPERIMENTS

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

2. The observation trial on yellowing palms at Iranaville Estate, Chilaw, was maintained until August 1970.

3. The programme of "Isotope Studies on the efficiency of fertilizer utilization by Coconut Palms" was continued during the year.

4. **Field Experimental Results of Interest are:—**

(i) Response to both phosphorus and potash was evident in the Response Curve Experiment at Bandirippuwa.

(ii) Highly significant response to phosphorus and potash was shown in the Manurial Experiment on Young Palms at Ratmalagara.

(iii) The copra from the "no sulphur" plots in the Quality of Nitrogen Experiment at Mawatte Estate showed no adverse symptoms despite the non-supply of sulphur for the last six years.

(iv) Young coconut seedlings planted in jungle clearings at Pothukulama have responded to potash and phosphorus.

(v) Increases ranging from 241 to 650 per cent over the premanurial yield have been obtained in the observation trial on yellowing palms at Iranaville Estate, Chilaw.

(vi) At Marandawila Estate, Bingiriya there has been no evidence of any significant difference between inorganic and organic fertilizers.

(vii) At Naiwala Estate, Veyangoda, potash produced remarkable response. From 33 nuts per palm, the yield has gone up to 53 nuts per palm in the third year of manuring.

B. LABORATORY INVESTIGATIONS

1. Leaf analyses for radioactivity and moisture estimations on soil samples were carried out in connection with the radioisotope experiment at Mawatte Estate, Dankotuwa.

2. Leaf samples from the Isolated Seed Garden, Ambakelle, were analysed for N, P, K, Ca and Mg.

3. Leaf samples from miscellaneous sources were analysed for mineral elements.

4. Estimation of organic carbon in soil samples taken from Horrekelle Estate and the Hybrid and Variety Blocks of the Botanist at Bandirippuwa Estate, was carried out during the year.

C. SOIL SURVEY

1. Soil Surveys of areas in the Kurunegala one-inch sheet were conducted during the year.

2. Detailed soil surveys of selected areas affected by "Leaf Scorch Decline" in the Ambalangoda and Galle one-inch sheets, were continued.

3. Miscellaneous soil surveys, mainly in connection with projects and schemes initiated by Government were undertaken by the Soil Survey Unit.

II. DIVISION OF BOTANY AND PLANT BREEDING

1. *Controlled Pollination Work*—This was carried out at Bandirippuwa, Ratmalagara, Isolated Seed Garden, Achchitotam, Marandawila, Kiniyama and Andigedera Estates. Work on 250 mother palms was commenced in July at the Coconut Progeny Trial, Walpita. As in previous years, two types of crosses have been done: (a) *typica* × *typica* (where the male parent is a prepotent) and (b) *typica* × *pumila*. During the period under review, over 179,000 female flowers have been pollinated consisting of 105,291 *typica* × *typica* crosses and 73,758 *typica* × *pumila* crosses. The supply of hybrid seed is further augmented by random pollination of emasculated *pumila* palms at the Isolated Seed Garden, Ambakelle.

29,222 *typica* × *typica*, 13,947 *typica* × *pumila* and 11,561 *pumila* × *typica* seednuts were harvested from pollinations done in 1969.

Research Nursery—The undermentioned quantities of seednuts were planted in the Research Nurseries at Bandirippuwa Estate and Ambakelle.

Typica × *typica*	*Typica* × *pumila*	*Pumila* × *typica*
29,572	9,813	11,319

Total = 50,704

For the year under review, 1276 applications were received for hand pollinated seedlings for May/June, and 344 applications for the October/November, planting season.

504 applicants for May/June and all applicants for October/November received allocations. 23,932 seedlings were issued consisting 10,345 *typica* × *typica*, 6,786 *typica* × *pumila*, 3,126, *pumila* × *typica* and 3,675 *typica* (open pollinated).

340 applications for May/June 1970 were carried forward to May/June 1971.

The private sector continues to receive assistance to implement their programmes of controlled pollination, and 586 samples of *typica* (prepotent) and 481 samples of *pumila* pollen have been issued to 20 estates.

2. *Mother Palm Seed supply*—The Planting Division nurseries were supplied with 1,768,574 selected mother palm seednuts.

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

4. *Isolated Seed Garden, Ambakelle*—Removal of dud palms and "below average" performers was commenced in Fields 1, 2, 3, 4, 7 and 8. Due to a good distribution of rainfall, the palms have improved considerably and Field No. 1 which was adversely affected holds promise of good crops in 1971.

Under the "re-afforestation Schemes" an additional 5,000 teak seedlings were planted this year. 11,500 teak seedlings (from the 20,000 planted in 1969) have been established in an area which is not entirely suitable for teak.

5. New experiments initiated during the year were:—

1. An investigation on the extent of parthenocarpic nut development in the three colour forms of the variety *nana*.
2. A study of the F_2 generation of *typica* × *pumila*.

III. CHEMISTRY DIVISION

1. *Pot Culture Experiment*

(i) The first sand-pot culture experiment laid down on 23rd October 1969 to study the distribution of iron, manganese and boron in the various components of seedlings subjected to 8 different treatments (+ ALL, -ALL, -N, -P, -K, -Ca, -Mg and -T.E) was continued.

At the amputation stage on 21st January 1970, the plants were thinned down to 26 per pot and samples of root, shoot and nut components were taken from each treatment for analysis. The chemical examination of these for iron, manganese and boron were completed during the course of the year.

(ii) An experiment laid down in Mitscherlich pots on 23rd June 1970, to study the effect of nutrient pH on the growth, uptake and distribution of all the essential nutrients in seedlings, is in progress.

Procedures have been worked out (*a*) to maintain within small ranges the different pH levels of the solutions in the sand cultures by increasing their buffer capacities and (*b*) to keep Ca, Mg and the heavy metals in solution at higher pH values, by the use of EDTA.

2. *Germination Experiment*

A new germination experiment was laid down in the nursery on 25th September 1970, testing three degrees of seednut maturity (fallen dead-ripe nuts first bunch nuts and second bunch nuts and three nut-size categories (15 cm., 17.5 cm., and 20 cm., short axis). The object of this experiment is to determine the effect of seednut maturity and seednut size on the rate of germination and seedling growth. A, 9 × 9 Latin Square design with 81 plots of 9 seednuts each, has been used for the experiment.

3. *Nutritional Studies on Toddy*

An experiment to study the diurnal and seasonal fluctuations in the concentration of iron, manganese and boron in coconut toddy was commenced during the year. Samples from six palms were collected in polythene lined pots at weekly intervals and analysed for iron, manganese and boron.

4. *Studies on Leaf Growth in Relation to Bearing Status*

A study was commenced to determine the relationship between (*a*) age and leaf growth and (*b*) leaf growth and bearing status of coconut palms. The main observations have been as follows:—

(i) In 10 year old palms, the lengths of leaf and petiole and the total number of leaflets in the most mature green frond, were significantly greater in the non-bearing than in the bearing palms.

(ii) The length of leaf and the length of leaflets increased initially up to the 10th year, and then progressively declined with age.

(iii) The length of petiole decreased with age, with greater accentuation after the tenth year.

The studies are being continued.

5. *Coconut Varieties*

Samples of copra prepared by the Division of Botany from different varieties and forms of coconut grown in Ceylon were examined and reported on for oil content.

IV. AGROSTOLOGY DIVISION

1. *Soil Nutrient Studies*

Studies on the nutrient status of the soils sampled from the Mawathagama area of the Kurunegala District which commenced during the previous year were completed during the year under review. Soils from areas which are under pasture and normal estate weeds were compared. It was found that while soils under both conditions were deficient in N.P. and K., the degree of deficiency as measured by the response of the indicator plant was much less in soils where pasture has been grown with the addition of N.P.K. fertilizer. This shows that there had been a general build up of soil fertility in areas planted to grass and adequately manured.

Soils from the 'leaf scorch' affected areas of Baddegama were also sampled during the year for nutrient status studies. The experiments set up are in progress. The preliminary data indicate that the soils are acutely deficient in N.P. & K and to a lesser extent in Ca and Mg.

2. *Pasture Ecology*

Management studies on Pangola grass and *B.miliiformis* initiated in the previous year were continued during the year. In addition to these the following experiments were set up.

(*a*) Response of Pangola grass to levels of added N and frequencies of cutting at Ratmalagara and Bandirippuwa Estates.

(*b*) Response of B.ruzezensis to levels of added N and frequencies of cutting at Bandirippuwa Estate.

(*c*) Response of *B.miliiformis* to levels of added N and frequencies of cutting.

All these trials are in progress.

All long term experiments studying pasture-coconut competition were managed to schedule.

3. *Subsidiary food crops*

A trial was conducted to evaluate the yield potentialities of 4 varieties of Soya Bean (*Glycine max*) when planted as an intercrop with coconut. The four varieties were:

1. Black Manchurian,
2. T.K. No 5
3. Thaichung E.26
4. Glycine Rugget.

Although the trial could not be completed due to late planting, data for components other than seed yield have been collected.

4. *Cattle*

In the field of cattle husbandry under coconut a new breeding programme was initiated during the year. This programme involves the rotational crossing of Sinhala cattle to three other breeds viz. Sindhi, Jersey and Friesian.

Milk production during the year was satisfactory.

V. CROP PROTECTION DIVISION

1. Parasites of the Coconut Caterpillar, *Nephantis serinopa* Meyr., were bred in the laboratory and released in affected estates. Census information on the fluctuations of the population densities of the pest and parasites was collected from 4 estates each in the Eastern and North Western Provinces and one estate in the Western Province. The field experiment on the parasitism of the pest by *Spoggosia bezziana* Bar. was continued on Boone Island in the Batticaloa lagoon. Studies on the morphology of *Nythobia* sp. and *Spoggosia bezziana* were carried out.

2. Population studies on the Coconut Scale, *Aspidiotus destructor* Sign., were in progress in three estates in the North Western Province. There appeared to be a decline of the pest in these estates. One estate was regularly sprayed with insecti-

cide to control the pest; here, predators were found in insignificant numbers. In another estate although the predator was present spraying was necessary. In the third estate the predator was abundant and spraying was not necessary.

3. On the basis of the field experiments to test the efficiency of a trap designed to collect the Red Weevil, *Rhyncophorus ferrugineus* F. the traps were recommended for use on estates. It appears that the trap is very effective in reducing the populations of the pest on estates; this is particularly so on estates surrounded by neglected holdings which form breeding grounds for the Red Weevil.

4. Arrangements were made for testing out chemosterilants against the Red Weevil; this work will be done in the coming year with the co-operation of the Dept. of Zoology, University of Ceylon, Colombo.

5. *Platymeris levicollis*, which was predatory on the Red Weevil in the laboratory, was released in holdings affected by the pest in the Wennappuwa area.

6. The following Field Experiments were in progress:

(*a*) Effect of defoliation on yield of coconut

(*b*) Effect of fungicide on Bud Rot affected palms.

7. An experiment to determine the effect of draining Deniya soils on 'Leaf Scorch' affected palms was laid down at Kirimetiya Estate, Elpitiya and Rathmehera Estate, Gonapinuwela.

8. An experiment to determine the effect of 'Leaf Scorch' on nut size, yield of copra etc. was laid down at Sirikandura Estate, Dodanduwa.

9. Comparative histological studies on palms showing different disorders were carried out with the co-operation of the Department of Botany University of Ceylon, Colombo.

VI. BIOMETRY

1. *Statistical Work*—Statistical Work of the research divisions was attended to. Most of the work was for the Soil Chemist and the Crop Protection Officer.

2. *Calibration Trial*—The recordings were maintained as per schedule.

3. *Agri-Meteorology*—The three meteorological stations at Bandirippuwa Estate, Ratmalagara Estate and the Isolated Seed Garden were maintained satisfactorily.

4. *Research*—

(i) *Crop Forecasting*—Collection and tabulation of fertilizer use data required by the Chairman, Coconut Research Board absorbed most of the spare time available after the essential routine duties were attended to. As such, work on "Crop Forecasting" had to be temporarily suspended during the year.

(ii) *Calibration of experiments*—Analysis of the 300 palm block yield data in order to determine the efficiency of calibration with pre-experimental yield data was completed.

(iii) *Mature Nutfall*—Data from the Calibration Trial were examined with a view to determining the extent and the seasonal pattern of mature nutfall on coconut plantations.

5. *General*—

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

(ii) The Biometrician did a series of field visits supervising the field work of the All Island Coconut Survey conducted by the Department of Census and Statistics.

(iii) Assistance was given to the Ceylon Coconut Board in the Classification of Desiccated Mills on the basis of product quality maintained.

VII. ADVISORY DIVISION

1. *Advisory Visits*:

(*a*) During the year 7,688 visits have been made by the Field Staff to coconut lands for advice and demonstrations on planting, soil conservation, draining, manuring, cultivation, pests and diseases control and for Fertilizer Subsidy Inspections.

(*b*) 16,144 holdings in all were visited in connection with general advisory work. 2,182 holdings were visited for advice, and demonstrations in connection with pests and diseases.

(*c*) The field staff delivered 110 talks at 120 meetings attended in their ranges.

The division participated in six National Exhibitions held in Kurunegala, Polonnaruwa, Batticaloa, Badulla, Ratnapura and Anuradhapura.

2. *Demonstration Centres:*

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

3. *Citronella Subsidy Scheme:*

The inspection of lands for the payment of cash subsidy and the issue of free fertilizer comprised the main items of work for the year under this Scheme.

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

Number of applicants to whom permits were issued 721

Number of applicants who took delivery of fertilizer 654

Amount of fertilizer distributed —423 tons. 7 cwts. 56 lbs.

VIII. PLANTING DIVISION

1. *Seed-nuts:*

The Planting Division maintained 14 nurseries during the year. A total of 2,527,299 seednuts in all were purchased during the year and were laid down in the nurseries for issues as follows:—

Season			*Seednuts*
October/November	1970	..	884,370
May/June	1971	..	543,435
October/November	1971	..	1,099,494
Total		..	2,527,299

2. *Seedlings:*

Orders were received and bookings made for 1,607,056 seedlings for the undermentioned issue seasons:—

Season			*Seedlings*
October/November	1969	..	72,741
May/June	1970	..	351,793
October/November	1970	..	1,182,522
Total		..	1,607,056

The position regarding actual issues of seedlings from the fourteen nurseries was as follows:—

Season			*Seedlings*
October/November	1969	..	196,103
May/June	1970	..	375,755
October/November	1970	..	1,031,563
Total issues		..	1,603,421

IX. PUBLICATIONS UNIT AND LIBRARY

1. *Journals:*

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

(*a*) *Ceylon Coconut Quarterly*
Vol: XX, Numbers 3 and 4
Vol: XXI, No. 1/2.

(*b*) *Ceylon Coconut Planters' Review*
Vol: VI, No. 1
Vol: VI, No. 2 was sent to the Press.

(c) *Pol Pawath:*
Vol: IV, No. 3
Vol: IV, No. 4, was prepared for the press.

2. *Advisory Leaflets:*

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

3. *Radio Talks*

11 radio talks in Sinhala were broadcast during the year.

4. *Library Bulletin*

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

DIVERSIFICATION OF SMALL SCALE AGRICULTURE

The agricultural policies of the past two decades were directed primarily at the development of three major crops—tea and rubber in the export sector, and paddy in domestic peasant agriculture. In the export sector the emphasis was on the improvement of the large-scale plantation; the small-holder, particularly in coconut and rubber, was relatively neglected. The government programmes which benefited the peasant farmers concentrated almost exclusively on paddy. This was true of the massive outlay on colonisation schemes as well as the institutional support and extension services that were provided in the rural sector. Many areas with a high potential for growth, such as coconut, animal husbandry, horticulture, received little attention. As paddy still remains the crop with the largest potential for import-substitution it has unquestionably very high priority in the Agricultural Plan. But the modernisation of peasant farming cannot be accomplished on the basis of mono-crop agriculture. The gap between population and resources has to be met by an expansion and diversification of small-scale agriculture on a much wider and more systematic basis than hitherto attempted.

Ministry of Planning and Development: (1971) *The Five Year Plan.* P. 33. Colombo. Department of Government Printing.