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CONTENTS

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REPORT OF THE DIRECTOR – 1980

This Report deals with the activities of the Coconut Research Board and covers the period 80.01.01 to 80.12.31.

1. THE COCONUT RESEARCH BOARD

(i) Twenty one meetings of the Coconut Research Board were held during the year. Membership and attendance at meetings were as follows.

Prof. B. A. Abeywickrama (*Chairman, attendance* 21/21)
Mr. S. C. Kahawita (*attendance* 20/21)
Dr. D. V. Liyanage (from 1*st September* 1980, *but was out of the Island*)
Mr. H. Don Moses (*until* 31 *August* 1980*; attendance* 8/15)
Mr. M. S. C. Peiris (*until* 31 *August* 1980, *attendance* 15/15)
Mr. K. F. J. Perera (*attendance* 15/21)
Dr. O. S. Peries (*attendance* 11/21)
Mr. S. Senanayake (*attendance* 14/21).

(ii) With effect from 15th February 1980, Mr. M. S. C. Peiris was appointed to visit and overlook the Institute's Estates and sub-stations and to recommend measures for their improvement. His special attention was directed to the Isolated Seed Garden, Ambakelle.

Several measures that he recommended to alleviate the severe effects of drought on this plantation, were implemented and a marked improvement was seen. Recommendations with respect to the other properties were communicated to Officers-in-charge for compliance.

(iii) Mr. S. Senanayake was appointed as Working Director with effect from 10th October 1980. The Board requested him in the first instance to direct his attention to all matters concerned with the running of the Institute's Estates and Nurseries.

(iv) The Board held the following three of its meetings away from Headquarters on –

1980.02.08 at Isolated Seed Garden, Ambakelle.
1980.03.07 at Ratmalagara Estate, Madampe,
1980.05.09 at Walpita Station, Kotadeniyawa.

These enabled the members to inspect the estates and experiments on site. Relevant members of the Scientific staff were on hand to explain activities and to participate in the discussion.

(v) Two special meetings of the Board held on 1980. 11.28. and 1980.12.19 were devoted exclusively to a discussion of the Research Programmes of the Divisions. Heads of Divisions and senior members of the research staff participated in these discussions.

The Board carried out an evaluation of the Research in progress in the Institute and made recommendations with a view to making the work more effective.

2. STAFF MATTERS

Visits abroad Dr. U. Pethiyagoda (Director) undertook a fortnight's Study Tour in India to see developments in the coconut Hybrid Programme as a Consultant on an APCC/ESCAP Project.

Mr. M. J. C. Perera, (*Librarian and Project Leader, Coconut Information Centre*) was in the Philippines from 3rd to 7th March to attend the Congress of the International Association of Agricultural Librarians and Documentalists.

Mr. K. G. Wijeweera (*Library Assistant*) followed a course on Information storage and retrieval systems in India from October to December.

Returned from Postgraduate Training

Dr. P. Kanagaratnam – RA/Crop Protection with Ph.D. having trained in Insect Pathology.
Mr. M. de S. Liyanage EO/Agronomy having completed an M.Sc. Programme

Continued on Postgraduate training

Mrs. S. M. Karunaratne, RA/Botany
Mr. V. U. de S. Jayasuriya, RA/Botany
Mr. M. N. M. Ibrahim, RA/Agronomy
Mr. S. L. Talagala, RA/Chemistry
Mr. R. T. Shanmuganathan, RA/Soils

Recruitments

Mr. A. Jayatilleke, RA/Botany from 2.1.80
Mr. M. A. Thilakasiri, RA/ Biometry from 1.9.80
Mr. T. S. G. Peiris, RA/Biometry from 1.9.80

Retirements

Mr. A. B. A. Jayamaha, SFA/Soils on 5.5.80
Mr. G. Rajapakse, SFA/Soils on 15.4.80
Mr. V. Abeywardena, Biometrician on 10.10.80
Mr. H. W. Fernando, SFA/Planting on 6.5.80

Deaths:- Dr. A. S. Amarasinghe, (RA/Soils) on 26.9.80

Resignations

Mr. A. Jayatilleka, RA/Botany on 3.11.80
Miss S. Dharmawardene, RA/Botany on 13.7.80
Mrs. K. V. Vitarana, Head/Processing Research Division on 17.07.80
Mr. R. M. de Silva, Superintendent on 14.12.80

3. ACTIVITIES OF THE RESEARCH DIVISIONS

(a) **General** – Following upon the recommendations of the O. S. Peries' Committee, action was taken to re-organize the research Divisions. As a consequence, the following Divisions,

Agronomy,
Biometry and Agricultural Economics,
Genetics, Plant Breeding and Propagation,
Chemistry,
Crop Protection,
Plant Biology,
Processing Research,
Soil Science,
Advisory and Extension Service and Documentation

were instituted to cover the functions hitherto covered by the earlier Divisions/Units

Agrostology,
Biometry,
Botany,
Chemistry,
Intercropping,
Planting,
Soils,
Publications/Publicity and Library.

However, for convenience of presentation and pending the commencement of a sufficient programme of research, the activities of the Divisions of Breeding and Propagation and Plant Biology are jointly presented under the heading of "Botany and Plant Breeding" and the activities in Processing Research, under "Chemistry". The next Annual Report will give the programmes under the relevant operational Divisions.

(b) Agronomy

A large number of experiments concerned with the performance of pasture and fodder species under different environmental and management situations have been carried out since the inception of this activity in the mid-1950's. A first attempt has been made to collate all of this information as a prelude to focussing research in this field towards different objectives.

Intensified studies are planned that will give greater attention to balance sheets and nutrient circulation in the grass-coconut complex, the effects of application of lime and the establishment of stable grass-legume mixtures and an emphasis on the nutritional value of animal feedstuffs and grass.

The role of cover crops in relation to nitrogen fixation and nutrient and moisture utilization and the more fundamental aspects of the total environment will be further priority areas of study.

In accordance with Government policy which has established subsidies for the perennial crops, coffee, pepper and cocoa, intensified attention has been given since 1979 to research on these crops in association with coconut. Work continues with the objective of evolving a stable mixed crop complex under coconut.

Tentative recommendations of potential crops for the different agro-ecological zones within the coconut triangle, have been made.

Walpita and Sirikandura in the Wet Zone have developed into active centres of intercropping research.

As foraging areas have become seriously limiting on our own Estates, part of the herd comprising the cattle upgrading project has been handed over to the charge of the National Livestock Development Board, which has kindly undertaken to maintain the herd and monitor performance under our guidance.

(c) Biometry and Agricultural Economics

The Division continued to discharge its major service function of assisting other Divisions in the planning, designing and analysis of their experiments.

Useful conclusions were drawn regarding the use of vegetative and yield characters as indices of performance.

The irrigation experiment at Ratmalagara has furnished impressive evidence of the beneficial influence of watering on several yield parameters.

A "copra conversion" index applicable to freshly harvested nuts will assist greatly in calculating copra yields from field trials.

(d) Botany and Plant Breeding

As explained earlier, activities which will progressively develop into the functions of the newly created Divisions of Plant Breeding and Propagation and Plant Biology are presented jointly under this heading.

Population distribution studies on the plantings at Bandirippuwa illustrated the high range of variability between individuals in a uniformly-treated planting.

A new observation trial on seedlings obtained by germinating seednuts from hybrids and maintained with generous fertilizer applications was commenced and should yield very interesting results.

Under the guidance of the late Mr. M. S. C. Peiris (Board Member), several improved agronomic practices were introduced at the Isolated Seed Garden, Ambakelle and are already showing considerable benefits in performance and survival in the drought. The performance of the Dwarfs planted under mature coconut at Horrekelly Estate continued to be disappointing.

A re-examination of the objectives and performance of the several genetic trials established through the years seems necessary.

(e) Chemistry

Some finality was reached in evolving a reliable sampling technique for evaluating the nutritional status of the coconut palm. The information will now be extended to field evaluation of leaf analyses as an indicator of yield and performance. This technology will be extended to intercrops as the next phase.

As a postgraduate project for a Technical Assistant, much information has been gathered on the succession of microflora in fermenting sap and the associated biochemical changes.

A highly promising "champagne" type of bottled coconut wine has been developed up to the point of possible commercial use.

Necessary equipment for gas-chromatographic studies of volatile constituents of arrack is now installed. This should enable characterisation and improvement of arrack quality.

(f) Crop Protection

Many calls were made on the services of this Division in attending to pest and disease problems in several localities and advice, assistance with spraying and supply of parasites and predators were provided as necessary.

It is evident that black beetle is assuming the proportions of a major problem in the newly planted coconut in the cyclone devastated areas of the Eastern Province. Surveillance, extension and appropriate control measures are organised. Sporadic outbreaks of coconut caterpillar were experienced and control strategies appropriate to each situation were employed. Over a quarter of a million of parasites bred in the insectary were released against this pest.

Coconut scale appears now to be under good natural control and the pest did not cause any anxiety during 1980.

Red Weevil however continued to be a problem particularly in the dry conditions of the Puttalam District and the importance of care, sanitation and early detection is stressed.

The major outbreak of coconut leaf miner in the Galle area that was reported in the Annual Report for 1979 was very satisfactorily brought under control by parasite releases. The effect on subsequent yield is now under study.

Other than a new record of a leaf disease caused by a fungus, there was no change in the pattern of disease occurrence.

During the year plans were drawn up for an intensified study on leaf scorch and at the same time, on "dud" and "tapering" palms. This is a co-ordinated research effort to be handled principally by the Division and a start has been made on priority studies.

(g) Soils

Routine long-term experiments on the major nutrient elements, nitrogen, phosphorus, potassium and magnesium were satisfactorily maintained.

It is reasonable to expect that adequate fertilizer applications in the early pre-bearing stage will exert an important influence on subsequent performance and yield. A critical trial to test this hypothesis is in progress at Bandirippuwa.

Increased attention is also being directed to the chlorine nutrition of coconut and to compare ammonium chloride with the traditional nitrogenous fertilizers, urea and sulphate of ammonia.

A recorded case of boron deficiency has been intensively studied and the problem overcome by applications of sodium borate.

Attempts to substantiate field trial data by glasshouse experiments, laboratory investigations and soil survey results were made.

Soil Survey mapping of all estates belonging to the Institute was completed and attention shifted to similar studies in the Institute's nurseries.

(h) The Marawila Agricultural and Industrial Exhibition

An Exhibition and Carnival was held at Marawila in Decembei to generate funds for Electorate (Nattandiya) development. One of the events it was intended to mark was the completion of Fifty Years of research by the Coconut Research Institute.

As was fitting, the Institute participated fully by running a stall depicting the activities of the Institute and a live exhibit to illustrate intercropping and good agronomic practices under coconut.

Both exhibits won the wide appreciation of visitors to the Exhibition, for their excellence.

4. FOREIGN ASSISTED PROGRAMMES

(a) The East Coast Rehabilitation Project

Under the European Economic Commission and Italian Government assistance for the rehabilitation of the cyclone-damaged coconut plantings in the Eastern Province, the Institute is required to establish three Demonstration Farms/Research Centres in appropriate representative locations.

Work is in progress at one of the sites while the selection of the other two is still pending. Equipment for leaf analysis and other agronomic activities is on order.

The Institute co-operated fully in providing seednuts for two successive years of planting. Three nurseries were maintained and seedlings grown and issued by the Coconut Cultivation Board.

(b) The Coconut Information Centre

This was established with finances provided by the International Development and Research Centre (Canada). 1980 saw the work of the Centre gathering momentum. A directory of Scientific Workers and Research in Coconut was prepared, two issues of a Newsletter were released and work on a Bibliography was nearly completed.

A Multilith printing machine purchased under this project is proving exceedingly useful in preparing Advisory Leaflets and other publications. The Project has also provided training for two members of the library staff.

(c) Asian Development Bank Loan

A loan from the Asian Development Bank for investment in the coconut sector is under negotiation. Under the proposals envisaged, the Research Institute will receive finances for :

Upgrading infra-structural facilities at the Institute,
Provision of irrigation facilities at the Isolated Seed Garden, Ambakelle, and
The establishment of a new Seed Garden for producing hybrids.

(d) Integrated Rural Development Projects (World Bank)

Several District projects under the Integrated Rural Development Programmes in operation with World Bank Assistance envisage important support for the coconut sector. The Institute has collaborated fully.

Under the Puttalam District Project, a 5-acre Demonstration Farm is in the process of establishment. It will demonstrate the cultivation of coconut and intercrops under irrigation and also optimal cultivation and agronomic management methods.

U. PETHIYAGODA
Director

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REPORT OF THE AGRONOMY DIVISION – 1980

A. STUDIES ON INTERCROPPING WITH PASTURES

1. Soil nutrient status studies

During the year under review soils were sampled from the Walpita estate (W/E). From a soil survey conducted four major soil types belonging to the (a) Boralu series, (b) Pallama series, (c) Rathupasa series and (d) Sudu series were identified. Since Walpita Estate is earmarked for development as a major intercropping research centre in the Wet-Intermediate rainfall zone, a study of the soil nutrient status was undertaken during the year.

Preliminary studies on the effect of major nutrients, N, P, K, Ca and Mg on the indicator plant (*Paspalum commersonii*) grown on these soils were completed. This was a 2^5 factorial pot experiment of two levels of each of N,P,K, Ca and Mg with two replicates of all treatments. The data from the trials are summarised in Table 1.

Table 1. *Total dry matter yield (g) per pot for the three harvests (mean of two replicates)*

Treatments				Ca_0		Ca_{10}	
				Mg_0	$Mg\ 1\frac{1}{2}$	Mg_0	$Mg\ 1\frac{1}{2}$
Pallama series	K_0	P_0	N_0	0.68	0.85	0.90	1.10
			N_5	1.68	2.05	1.54	1.62
		P_3	N_0	1.65	1.18	1.54	1.97
			N_5	5.38	6.43	7.48	8.47
	K_3	P_0	N_0	1.15	1.43	1.15	1.38
			N_5	1.86	3.68	1.74	2.33
		P_3	N_0	1.92	2.67	2.16	2.37
			N_5	12.21	11.93	12.26	12.93
Boralu series	K_0	P_0	N_0	0.35	0.36	0.41	0.46
			N_5	0.65	0.61	0.64	0.65
		P_3	N_0	2.13	1.13	1.65	3.35
			N_5	6.92	7.65	6.94	7.55

	K_3	P_0	N_0	0.50	0.76	0.72	0.49
			N_5	1.26	1.15	1.17	0.93
		P_3	N_0	1.88	1.92	2.26	2.78
			N_5	14.81	14.92	16.24	14.84
	K_0	P_0	N_0	0.73	0.89	1.00	0.94
			N_5	0.30	0.63	1.86	2.80
		P_3	N_0	0.76	0.94	1.33	1.56
			N_5	1.64	1.87	2.43	2.64
Rathupasa series							
	K_3	P_0	N_0	1.10	0.95	1.38	1.32
			N_5	1.94	0.27	2.57	2.03
		P_3	N_0	1.75	1.74	1.52	1.76
			N_5	9.16	11.49	15.55	15.96
	K_0	P_0	N_0	0.63	0.71	0.76	0.68
			N_5	0.80	1.27	1.44	1.48
		P_3	N_0	1.50	2.06	1.97	2.10
			N_5	2.39	4.16	4.98	6.08
Sudu series							
	K_3	P_0	N_0	1.07	1.35	1.11	1.26
			N_5	1.29	0.91	2.06	2.55
		P_3	N_0	1.62	1.67	2.05	2.71
			N_5	11.28	6.22	11.49	13.34

N_0, P_0, K_0, — 0 kg/ha. P_3, K_3 — 370 kg/ha. N_5 — 625 kg/ha.

The data indicate that all four soil series are deficient in N,P and K. While there was no significant response to Ca in the Boralu and Pallama series an increase in plant dry matter production of over 40% due to addition of Ca was recorded for both Rathupasa and Sudu series. The determination of the optimum requirements of the deficient nutrients is being continued.

Experiment P_{95} (Bandirippuwa estate)

To study the effect of four levels of nitrogen application and three frequencies of defoliation on the dry matter production, persistence and quality of *Brachiaria ruziziensis* grown under coconut.

One cycle of defoliation was completed during the year. The mean dry matter yields for the four replicates are given in Table 2.

The data indicate a progressive increase in yield due to increase in the levels of added nitrogen while there appears to be an increase in production at higher frequencies of defoliation (short intervals).

Table 2. *Dry matter yield (kg/ha) of B. ruziziensis per cycle of defoliation at different levels of fertilizer nitrogen application and different frequencies of cutting when grown under coconut at Lunuwila (Mean of four replicates)*

Levels of N (kg/N/ha/cycle)	*3 weeks (kg/ha)*	*4 weeks (kg/ha)*	*6 weeks (kg/ha)*	*Total (kg/ha)*
N_0	2453.0	2226.0	2443.0	7122.0
N_{25}	2899.0	2607.0	2505.0	8011.0
N_{50}	3914.0	3398.0	2363.0	9675.0
N_{100}	4647.0	4347.0	3731.0	12725.0
Total	13913.0	12578.0	11042.0	

3. Experiment P_{97} (Bandirippuwa estate)

To study the yield and persistence of a virus resistant strain of *Digitaria decumbens* (Pangola grass) at four levels of nitrogen application.

The experiment was sampled on six occasions during the year. A linear response to levels of added nitrogen was recorded. The pasture remained free from the stunting virus disease. Thus this strain has been proved to be resistant to the stunting virus disease that affects the strain introduced earlier.

The dry matter production data are given in Table 3.

Table 3. *Herbage dry matter yield of Pangola grass at different levels of nitrogen application grown under coconut at Lunuwila*

Levels of N (kg/ha)	*Dry matter yield (kg/ha)*
N_0	4317.0
N_{25}	5769.0
N_{50}	6919.0
N_{100}	9585.0

4. Experiment P_{94} (Bandirippuwa estate)

To study the total plant protein and dry matter output from *Centrosema pubescens* and *B. miliiformis* at three levels of applied nitrogen when grown alone and in mixture.

A progressive increase in yield of *B. miliiformis* due to increase in the level of added nitrogen both when grown alone and in combination with the legume has been observed earlier. However, due to problems faced regarding the management of this trial plot sizes were decreased to facilitate easy management.

5. Experiment P_{100} (Bandirippuwa estate)

To compare the milk yield of Sinhala X Jersey cross bred cows maintained solely on fertilized *B. miliiformis/Centrosema pubescens* mixed pasture with those fed on a ration of concentrates and estate grass.

This experiment was abandoned in November.

6. Experiment P_{99} (Walpita estate)

To study the performance of five pasture and four fodder grasses at two levels of nitrogen application in the wet zone-intermediate zone border areas.

Five samplings of herbage production were done during the year. The total herbage dry matter yields of the different varieties of pasture and fodder at the two levels of nitrogen are given in Table 4.

Table 4. *Herbage dry matter yield (kg/ha) for different pasture and fodder grasses at two levels of nitrogen application when grown under coconut at Walpita*

Grass	25 kg *N/ha per cut*	50 kg *N/ha per cut*
Pangola grass	3865.0	2545.0
B. brizantha	4748.0	5011.0
B. miliiformis	3336.0	4766.0
B. ruziziensis	4965.0	3733.0
B. dictyoneura	6783.0	8291.0
Green panic	6085.0	6775.0
Setaria anceps	6418.0	8610.0
Guinea grass	13476.0	14219.0
Pusa Giant Napier	7434.0	7123.0

It is seen from the data that of the pasture grasses, *B. dictyoneura* has given the highest yield and also the largest response to added nitrogen. A negative response has been recorded for Pangola grass and *B. ruziziensis*. The negative response in the case of Pangola grass is due to the fact that it is more susceptible to the stunting virus disease at the higher levels of nitrogen application while in the case of *B. ruziziensis* it may be due to the lack of adaptation in the lower rainfall areas. Out of fodder grasses, Guinea grass has given the highest yield and also the largest response to added nitrogen.

7. Experiment P_{101} (Ratmalagara estate)

To measure the effect of two pasture legumes, *Centrosema pubescens* and *Macroptelium artropurpureum* (*Siratro*) and the shrub legume *Gliricidia maculata* combined with *B. brizantha* and the grass grown alone at the same level of nitrogen application on the live weight gains by cattle.

This experiment was terminated during the year as the two pasture legumes did not establish well in the presence of *Brachiaria* species.

8. Experiment P_{102} (Ratmalagara estate)

To study the performance of five pasture and four fodder grasses in relation to growth, yield and persistence at two levels of nitrogen application.

It is a 2 X 9 X 4 factorial randomized block design of two levels of nitrogen on nine varieties of grasses with each of the treatment being replicated four times.

Five samplings of herbage production were done during the year. The herbage dry matter yield data are presented in Table. 5

Table 5. *Herbage dry matter yield (kg/ha) of different pasture and fodder grasses at two levels of nitrogen application grown under coconut at Madampe*

Grass variety	*25 kg N/ha*	*50 kg/ N/ha*
B. miliiformis	7514.0	7260.0
B. brizantha	9505.0	8735.0
B. dictyoneura	8825.0	10427.0
B. ruziziensis	6423.0	7523.0
Pangola grass	7496.0	7246.0
Green panic	6817.0	6764.0
Guinea grass	7283.0	8841.0
Setaria anceps	6331.0	8486.0
Pusa Giant Napier	2662.0	3055.0

It is indicated that of all the fodder and pasture grasses *B. dictyoneura* gave the highest dry matter yield and also responded with an increased yield at the higher level of nitrogen application. Out of fodder grasses Guinea grass gave the highest dry matter yield.

9. Experiment P_{103} (Ratmalagara estate)

To study the effect of four levels of nitrogen fertilizer on the growth and yield of a virus resistant strain of Pangola grass grown under coconut under the rainfall conditions of Ratmalagara Estate.

It is a 4 X 4 factorial randomized block design of four levels of nitrogen application replicated four times.

This experiment was sampled on four occasions during the year. There was no incidence of the stunting virus disease in any of the plots. A linear response to added levels of nitrogen up to 50 kg/ha per cwt was recorded. There was a slight depression in yield when the level of nitrogen was increased to 100 kg N/ha per cwt. The data are presented in Table 6.

Table 6. *Herbage dry matter yield (kg/ha) of Pangola grass grown under coconut at Madampe at four levels of nitrogen application*

Levels of N/ha	*Dry matter yield*
N^0	4527.0
N_{25}	5478.0
N_{50}	6508.0
N_{100}	6383.0

10. Experiment P_{140} (Ratmalagara estate)

To study the effect of four levels of nitrogen application and two frequencies of cutting on the growth of Green panic (a strain of *Panicum maximum* fodder) under coconut.

It is a 4 X 3 X 4 factorial randomized block design of four levels of nitrogen fertilizer and two frequencies of defoliation with each of the treatments replicated four times.

Three cycles of defoliation were completed during the year. Herbage dry matter yield data are presented in Table 7.

Table 7. *Herbage dry matter yield (kg/ha) of Green panic at four levels of nitrogen application and two cutting frequencies when grown under coconut*

Levels N kg/ha	*Cut every 30 days*	*Cut every 45 days*
N_0	2027.0	1842.0
N_{25}	2410.0	2441.0
N_{50}	2049.0	2904.0
N_{100}	2566.0	2789.0

The data indicate a higher production of dry matter when the grass is cut once every 45 days. A progressive increase in yield with increase in the level of nitrogen application is also noted.

11. Experiment P_{105} (Ratmalagara estate)

To study the effect of different levels of nitrogen and phosphorus on a mixed sward of *Brachiaria brizantha/Siratro* under coconut at Ratmalagara estate (R/E).

It is a 4 X 3 X 4 factorial randomized block design of four levels of phosphorus and three levels of nitrogen with each of the treatments being replicated four times.

In this experiment the pasture sward consists of alternate rows of *B. brizantha* and *Siratro* planted 30 cm apart. The legume established completely only towards the latter part of the year and as a sequence fertilizer treatments were imposed in December. It was observed that the growth of legume component was suppressed by the grass.

12. Experiment P_{98} (Sirikandura estate, Dodanduwa)

To study the effect of four levels of nitrogen fertilizer and two frequencies of defoliation on the growth, yield and persistence of *Brachiaria dictyoneura.*

It is a 4 X 2 X 3 factorial randomized block design with four levels of nitrogen application and two frequencies of defoliation with each of the treatments replicated thrice.

Three cycles of defoliation were completed during the year. The data are presented in Table 8.

Table 8. *Herbage dry matter yield (kg/ha) of B. dictyoneura at four levels of nitrogen application and two frequencies of defoliation when grown under coconut at Dodanduwa*

Levels of N kg/ha	*Cut at 30 days intervals*	*Cut at 45 days intervals*
N_0	6353.0	6100.0
N_{25}	7793.0	6427.0
N_{50}	8420.0	6507.0
N_{100}	9107.0	6440.0

Defoliating at 30 day intervals produced 20% more dry matter yield than when defoliated at 45 day intervals. There was a progressive increase in yield due to increase in the level of nitrogen applications. This was significant when the pasture was defoliated at 30 day intervals.

In addition to the above, the following trials which were commenced at Bandiripuwa estate during Maha season this year are in progress.

13. To study the response to liming of a pasture grass/legume mixture of *Brachiaria miliiformis/Centrosema pubescens* grown on a sandy soil with special emphasis on dry matter production and P uptake from soil.

This is a randomized block design with five blocks with five levels of quick lime (CaO) such as 0,1.5, 3.0, 4.5 and 6.0 tons/ac/year.

14. To investigate the performance of different varieties of Ipil-Ipil (*Leucaena leucocephala*) under coconut.

This is a randomized block design with three varieties of Ipil-Ipil (Peru type, Cunningham and Hawaiian Giant) being replicated six times. Dry matter yield, crude protein, digestibility and animal acceptibility will be measured.

15. To study the rate of regrowth and vegetative composition of Ipil-Ipil after pruning.

With this objective in view 25 uniform Ipil-Ipil plants from a two year old plantation grown under an old stand of coconut were selected. All the plants were pruned to a uniform height of 165 cm above ground level in December and allowed to grow. Five plants selected at random from these will be sampled at regular intervals and will be sorted out for vegetative components and also fed to cattle to determine the edible portions in the sample. Crude protein content will also be determined.

B. STUDIES ON INTERCROPPING WITH CROPS OTHER THAN PASTURE

1. Bandirippuwa Estate

(a) To study the effect of three levels of fertilizer application on 10 coffee selections.

These are grown under a 35 year old stand of coconut. The 10 selections include three Arabicas and seven Robustas and the varieties are C36, S5, C111, IMY, CC I, K7, B0 72, C96 and GCR.

This year too the Arabica selections K_7, S_3 and B0 72 performed very poorly indicating their unsuitability for Bandirippuwa area. A sampling was done during the year for the determination of mean leaf dry weight. This is presented in Table 9.

Table 9. *Mean leaf dry weight* (g) *of* 10 *coffee selections grown under coconut at Lunuwila at different levels of fertilizer application.*

Coffee selection	½ *normal fertilizer*	*normal fertilizer*	1½ *normal fertilizer*
CCR	0.746	0.773	0.793
IMY	0.723	0.960	1.180
C36	0.790	0.863	0.806
K7	0.303	0.280	0.296
CCI	0.906	0.943	1.026
C111	0.730	0.680	0.766
S5	0.146	0.226	0.126
S274	0.016	0.953	0.890
C96	0.623	0.870	0.736
BO72	0.316	0.236	0.326

Normal – 680 g/plant/year
½ normal-340 g/plant/year
1½ normal-1020 g/plant/year

There is a progressive increase in the leaf dry weight with an increase in the level of fertilizer applied. The three Arabica selections have comparatively low leaf dry weight.

(b) To study the economic feasibility of growing the following crops under coconut. This trial also served trial as demonstration plots to the public.

1. Coffee
2. Cocoa
3. Pepper
4. Passion fruit
5. Pineapple
6. Banana
7. Cinnamon

Coffee and pepper have not come into production during the year. Passion fruit and pineapple crops had to be uprooted due to attack by mottling virus and mealy bug respectively.

The yield data of banana are given in Table 10.

Table 10. *Production data of banana*

Variety	*No of plants*	*Yield/year (kg)*
Ambul ..	279	419.7
Kolikuttu ..	286	200.4
Mondam ..	07	1.8

(c) To study the performance of 10 cocoa selections.

The selections are: ICS 95 X ICS 95 ; ICS 1 X ICS 1 ; ICS 95 X NA 32; NA 32 X PA 35 ; ICS 6 X PA 35 ; ICS 1 X NA 32 ; ICS 6 X ICS 95; ICS 8 X ICS 8; NA 32 X PA 7 ; ICS 95 X PA 7.

Due to limited availability of planting materials the vacancies could not be filled during the year. This trial served as a demonstration plot.

2. Sirikandura Estate, Dodanduwa

(a) Coconut Perennial crop competition trial.

The objective of this trial is to study the effect of perennial crops such as coffee, cocoa pepper, cinnamon and cloves and also their rotation with annuals on the yield of coconut in the wet zone. The treatments are replicated three times in a randomized block design.

The severe drought that prevailed during the previous year severely affected the intercrops during the year. The nut yield data in the intercropped blocks are given in Table 11.

Table 11. *Yield of coconut in the Various intercropped blocks (Dodanduwa)*

Treatment	*No of coconut bunches/ha*	*No of nuts/ha*
1. Control	843	4764
2. Rotation with annuals	951	6123
3. Coffee	1072	7695
4. Pepper	741	5080
5. Cocoa	875	6558
6. Cloves	798	5065
7. Cinnamon	936	7359

All intercropping treatments show an increased yield over the control. Coffee, cocoa and pepper continued to produce yields although the effect of the drought of the previous years could still be observed. The yield of coffee, cocoa, and pepper for the year was 165, 46 and 79 kg/ha respectively. It is too early to comment.

(b) Density of pepper under coconut at Dodanduwa.

This trial was planted in May to study the performance of pepper at different densities when planted under coconut. The densities studied are 120 cm X 120 cm and 180 cm X 180 cm. The pepper plants are trained on live supports of *Gliricidia* plants. The plants were manured and the vacancies were filled during the latter part of the year.

3. Walpita Estate

(a) Coffee

~~(a)~~ To study the effect of three planting densities and three levels of fertilizer application on the growth and yield of coffee and the effect of coffee on the production of coconut.

It is an experiment with randomised block with four replicates of all treatments. The planting densities are 240 cm X 180 cm, 240 cm X 240 cm and 240 cm X 300 cm. Fertilizer levels are ½ normal, normal and 1½ normal.

The vacancies resulting from the severe drought of the previous year were filled during the year. The stem girth measurement taken during the year together with the nut yield data are given in Table 12.

Table 12. *Mean stem girth of coffee and the nut yield of coconut due to different densities and levels of fertilizer application*

Levels of fertilizer	*Coffee planted 240 cm X 180 cm*		*Coffee planted 240 cm X 240 cm*		*Coffee planted 240 cm X 300 cm*	
	Stem girth (cm)	*Nut yield per ha*	*Stem girth (cm)*	*Nut yield per ha*	*Stem girth (cm)*	*Nut yield per ha.*
½ normal ..	7.11	7900	6.05	6784	5.72	7722
Normal ..	7.01	6547	7.92	6853	6.02	7446
1½ normal ..	5.77	6926	6.45	6665	5.94	5510

(b) Cocoa

To study the performance of four cocoa selections at three levels of fertilizer application.

This is an experiment of randomized block with four replicates of all treatments with four cocoa selections, namely, ICS 1, NA 32, Amelanado and Millawana with three levels of fertilizer, namely, ½ normal, normal and 1½ normal.

A large number of vacancies resulting from the severe drought of the previous year was filled during the year. The trial was manured in May and October to schedule. The stem girth measurement and the pod counts taken during the year are presented in Table 13.

Table 13. *Mean stem girth and pods per plant of different cocoa selections at three levels of fertilizer application*

Selections	½ normal		Normal		1½ normal	
	Stem girth (cm)	*No of pods/ plant*	*Stem girth (cm)*	*No of pods/ plant*	*Stem girth (cm)*	*No of pods/ plant*
ICS 1 ..	12.42	3	14.10	3	16.13	7
NA 32 ..	14.76	3	16.56	8	15.85	5
Amelanado ..	11.02	—	11.05	—	11.66	2
Millawana ..	12.65	—	13.72	—	11.33	—

(c) Mixed planting trial of coffee, cocoa and pepper

To study the agronomic feasibility of growing coffee, cocoa and pepper together as intercrops under coconut.

The scheme of planting is as follows.

Cocoa as a single row between two coconut rows. Cocoa plants spaced 3 metres apart in the row.

On either side of the cocoa row there are two rows of coffee plants 1.4 metres away from the cocoa row. Plants in the coffee row are 2.4 metres apart.

Pepper is trained on to coconut and also on to live support along the coconut row in both directions with two pepper plants between two coconut palms.

In the trial where coffee, cocoa and pepper are grown together as a mixed plantation under coconut, all crops appear to be doing satisfactorily. Almost all the pepper plants have come into production. The mean production per vine for the year was 465 g. All vines were systematically pruned during the year. Only a few of the coffee and cocoa plants came into production. Their performance and production appear to be satisfactory.

(d) Clove observational trial

An acre (0.4 ha) block of land is intercropped with cloves with a single clove seedling in the middle of each coconut square.

The planting holes are 90 cm X 90 cm X 90 cm. The clove plants in this trial are doing very satisfactorily. The plants have attained a mean height of over 200 cm and a spread of over 100 cm. There were no casualties during the year. Some plants are expected to flower in the coming year.

(e) Pineapple – pepper mixed cropping trial

In this trial pineapple and pepper are established as a mixed plantation under coconut. Pepper is planted in two rows 240 cm X 240 cm in the coconut avenue on live *Gliricidia* supports and at the base of each coconut palm. The pineapple (Kew variety) is planted in three rows 240 cm apart in the avenue with 45 cm between plants in the row. A double row of pineapple, 90 cm apart, is also planted along the coconut row between the palms.

Most of the pineapple plants had to be uprooted as a result of virus infection. The performance of pepper is very satisfactory.

In addition to the above, the following trials were started during the year.

1. To study the performance of mixtures and pure stands of maize and cowpea at three levels of nitrogen fertilizer application under coconut. This was commenced at Bandirippuwa estate during Yala season.

Treatments are as follows :

(A) Stand type: Pure maize 60 cm X 30 cm/ Pure cowpea 30 cm X 15 cm ; 1 : 1 maize/ Cowpea mixture. Alternate rows of maize 60 cm X 60 cm and cowpea 60 cm X 15 cm.

(B) Levels of nitrogen fertilization : N_0 — No nitrogen ; N_1 — 40 kg N/ha ; N2 - 80kg N/ha

One half of this will be applied as basal and the other half, 40 days after planting.

It is a split plot design with three replicates (nitrogen levels as main plots and stand types as sub plots).

The establishment of maize was very poor due to the failure of monsoon rains. Therefore the experiment was repeated in *Maha* and is in progress.

2. To study the effect of sowing date, nitrogen, and inoculation on the growth and yield of soyabean under coconut.

This was commenced during *Maha* season at Ratmalagara estate and is in progress. Treatments are as follows :

A. Sowing dates :
S_1 - Sown with the onset of monsoons ; S_2 - Sown two weeks after the onset of monsoons ; S_3 - Sown four weeks after the onset of monsoons ; S_4 - Sown six weeks after the onset of monsoons.

B. Levels of nitrogen fertilization : N_0 - No nitrogen ; N_1 - 40 kg N/ha

C. Inoculation : I_0 - Non inoculated ; I_1 - Inoculated.

Another trial was set up at Sirikandura estate, Dodanduwa to study the suitability of sweet potatoe as an intercrop under coconut for the wet zone and it is in progress.

C. ANIMAL HUSBANDRY

1. Rotational cross breeding project (Bandirippuwa estate)

To stabilise the hybrid vigour of Tropical X Temperate cross bred cattle by rotationally crossing them to Temperate and Tropical breeds. The foundation breed is Sinhala. The breeds selected for the cross breeding programme are Jersey, Sindhi and Friesian.

Milk yields during the year were as follows

i. Sinhala — 540 litres (2 cows)
ii. Jersey X Sinhala — 54,096 litres (65 cows)
iii. Sindhi X Jersey X Sinhala — 27,034 litres (43 cows)

According to results Sinhala, Jersey X Sinhala and Sindhi X Jersey X Sinhala crosses have produced milk yields of 2.5 pints/per day, 5 pints/day and 3.7 pints/day respectively.

Milk production and herd strength

A total of 81,678 litres of milk was produced at the two stations (B/E 80,672 litres, R/E 1,006 litres). There were 98 births (50 bull calves and 48 heifer calves) and 12 deaths (3 bull calves and 9 heifer calves) during the year.

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

	Bulls	*Cows*	*Heifer calves*	*Bull calves*	*Total*
Bandirippuwa Estate ..	2	108	60	59	229
Ratmalagara Estate ..	—	11	36	—	47
Kirimetiyana Estate ..	3	4	35	3	45
			Grand total		321

The entire herd was vaccinated against H.S. and Foot and Mouth and the health of the herd was maintained satisfactorily.

PERSONNEL

1. Messrs H. A. Abeysoma and A. M. U. Wijeratna assumed duties as Technical Assistants from 15.10.1980.

2. Mr. M. de S. Liyanage, Experimental Officer, resumed duties on 10.09.1980 after completing the M. Sc. (Agric) degree in Australia.

3. Mr. M. N. M. Ibrahim, Research Assistant, continued to be on overseas training in Australia.

GENERAL

The Agrostology Division and Intercropping Division were amalgamated and renamed as Agronomy Division with effect from 21.05.80. Dr. M. P. L. D. Martin, Research Officer, was appointed as Officer-in-Charge with effect from 01.05.80.

L. V. K. LIYANAGE
Officer – in – Charge

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REPORT OF THE BIOMETRY AND AGRICULTURAL ECONOMICS DIVISION — 1980

1. STATISTICAL WORK

The Division assisted all research divisions in the design of experiments and statistical analyses of data. Designs for the following new experiments were also prepared for the respective divisions.

(a) Division of Genetics, Plant Breeding and Propagation and Division of Plant Biology

1. To study the performance of coconut seedlings at different densities and at different positions (horizontal and vertical) for T X T and D X T varieties.
2. To study the performance of coconut seedlings (D and T) under different covers.
3. To study the effect of dehusking and heaping of nuts on germination of seedlings. (T X T variety).
4. To study the performance of seedlings (D X T and T X T) transplanted at different ages from the nursery.

(b) Division of Soils

1. To study the performance of three forms of phosphates at three levels each (glass house experiment).

(c) Division of Agronomy

1. To study on Variety X Density X Fertilizer on green gram under coconut.
2. To study the performance of mixtures and pure stands of maize and cowpea under three levels of nitrogen.
3. To study the effect of sowing dates, inoculation and nitrogen fertilizer on the performance of soyabeans.
4. To study the effect of nitrogen application on legume based pasture and planting time.
5. To study the N P K requirement of fodder grass and their effect on coconut yield.
6. To study the response to liming of two plant species grown on an acid soil.
7. To study the performance of three varieties of Ipil-Ipil under coconut.

8. To study the effect of lime and soil type on the performance of two plant species (glass house experiment).

9. To study the effect of light intensity on two varieties of legumes.

2. RESEARCH

2.1. Calibration Trial

The recordings of vegetative and yield characters of the palms in the experiment were carried out according to schedule. Some of the data collected in this experiment were used for the following study.

A selection index for seed parents in coconuts

An efficient selection index for mother palms in coconut is evolved through the technique of Principal Component Analysis.

This index can also be used as a calibrating variate for field experiments. It eliminates the need to keep pre-experimental yield record data for about two years, as all the characters incorporated in the proposed index can be measured at a given instant. Through this approach a reduction of the experimental error by about 50% can be expected.

Following are the four characters in the palm that can be measured at a given instant and which were used in this study.

1. Trunk girth just below the crown (mean of two measurements taken a foot apart).
2. Number of opened inflorescences including mature bunches.
3. Number of nuts per bunch (averaged over all opened inflorescences and mature bunches).
4. Number of green fronds present at a given time.

Details of these will be published elsewhere.

2.2 Watering experiment

This experiment was continued uninterrupted. The response to treatment in the year 1980 is shown in Table 2.

Table 2. *Yield per hectare per annum*

Treatment	*Nuts/Hectare/Annum*			*Weighted Average*	*No. of Waterings*
	Low Yield	*Mid Yield*	*High Yield*		
Control ..	4656	5347	9399	5890	Nil
Single dose weekly ..	6034	9150	11500	5860	28
Single dose fortnightly ..	5806	7437	9893	7334	14
Double dose fortnightly ..	7733	8210	12258	8739	14

The yields have been adjusted for pre-experimental differences, by means of covariance analysis. A significant response ($p = 0.05$) is shown by the mid yielding palms. On the average it appears that there is a response to watering at all levels of yield. At the beginning of the year the dosage was increased to 185 gallons of water per palm.

2.3 Copra Conversion Factor Experiment (Bandirippuwa Estate and Ratmalagara Estate)

These two experiments were concluded at the end of the year.

2.4 Bunch Thinning Experiment

The recording proper was commenced at the beginning of the year and was carried out according to schedule.

3. AGRI-METEOROLOGY

3.1. Meteorological Studies

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

3.2. Weather conditions during the year

Tables (3) to (5) how the weather conditions at the three stations.

Table 3. *Summary of meteorological observations during the year — Bandirippuwa Estate*

Month	*Total*		*Mean per day*					
	No. of rainy days	*rain-fall (mm)*	*Max. Tem. (c°)*	*Min. Tem. (c°)*	*Evapora-tion (mm)*	*Sunshine hours*	*Relative Humidity%*	
							am	*pm*
Jan.	0	0.0	32.0	21.7	5.3	8.3	75	51
Feb.	0	0.0	33.6	21.2	5.9	10.0	73	52
Mar.	1	68.8	33.1	23.2	5.5	9.0	72	62
Apr.	19	206.0	32.9	25.0	4.4	6.6	83	74
May	14	54.2	33.0	26.2	4.5	7.1	83	76
Jun.	15	308.1	31.2	25.9	4.2	5.5	85	79
Jul.	4	21.8	30.9	26.5	4.3	6.5	79	74
Aug.	12	78.2	30.8	25.7	4.0	6.8	80	75
Sep.	8	182.3	31.4	25.3	4.4	6.9	78	71
Oct.	14	364.4	30.7	24.0	3.8	5.1	84	77
Nov.	17	184.9	31.4	23.6	3.3	5.6	82	75
Dec.	6	102.3	31.1	22.6	3.6	6.9	82	71

Table 4. *Summary of meteorological observations during the year — Ratmalagara Estate*

Month	Total		Mean per day			
	No. of rainy days	*rain-fall (mm)*	*Max. Tem. (c°)*	*Min. Tem. (c°)*	*Relative Humidity %*	
					am	*pm*
Jan.	0	0.0	31.7	20.8	84	64
Feb.	0	0.0	34.4	21.2	88	78
Mar.	4	16.7	34.1	22.4	83	81
Apr.	16	208.2	33.4	24.7	88	81
May	14	74.0	33.0	25.9	85	78
June	16	246.1	30.9	25.6	90	89
Jul.	6	14.3	30.6	26.1	87	87
Aug.	11	31.2	31.1	25.6	88	88
Sep.	12	149.0	31.8	25.1	82	81
Oct.	16	239.6	30.6	23.8	91	80
Nov.	21	273.2	31.2	23.1	90	82
Dec.	14	126.4	30.2	22.4	91	79

Table. 5. *Summary of meteorological observations during the year — Isolated Seed Garden.*

Month	Total		Mean per day			
	No. of rainy days	*rain-fall (mm)*	*Max. Tem. (c°)*	*Min. Tem. (c°)*	*Relative Humidity %*	
					am	*pm*
Jan.	1	0.5	31.4	20.3	67	57
Feb.	0	0.0	33.6	20.9	86	51
Mar.	1	23.7	34.1	22.4	84	55
Apr.	16	164.5	33.0	24.5	89	68
May	7	87.8	32.9	25.7	86	73
June	9	147.9	30.7	25.5	85	75
Jul.	2	5.8	30.9	26.3	78	71
Aug.	4	10.0	31.7	25.6	77	67
Sep.	8	106.9	32.6	24.7	80	65
Oct.	13	272.1	30.9	23.5	90	77
Nov.	16	251.0	31.2	22.8	91	77
Dec.	15	82.7	30.7	22.1	92	73

Except for the month of January and February, the rest of the months indicate a rather good distribution of rainfall during the year at the three stations. This indicates good prospects for coconut in 1981 around these areas.

4. PUBLICATIONS

1. Abeywardena, V. and Mathes, D. T. (1980). A biometical approach to evolving a selection index for seed parents in coconut. (*Cocos nucifera L.*) *Ceylon Cocon. Q.*, 31, (in press).

2. Abeywardena, V., Mathes, D. T. and Karunasena, G. (1979). Brown and Green colour forms in the Sri Lanka Tall palm — some observations on their distribution and comparative vigour. *Ceylon Cocon. Q.*, **30**,101–106.

3. Abeywardena, V. (1979). Influence of watering on the yield of coconut. *Ceylon Cocon. Q.*, **30**, 91–100.

4. Loganathan, P., Mathes, D. T. and Balakrishnamurti, T. S. B. (1980). A fertilizer experiment with coconut on a lateriate gravelly soil with widely varying depths — Read at SLAAS Session 1980.

5. PERSONNEL

Mr. D. T. Mathes was elected as a Fellow of the Institute of Statisticians, London with effect from 19th August.

D. T. MATHES
Officer-in-Charge

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REPORT OF THE BOTANY AND PLANT BREEDING DIVISION – 1980

Reorganisation of the Research Divisions of the Institute resulted in the creation of two separate divisions, namely, (a) Division of Genetics, Plant Breeding and Propagation and (b) Division of Plant Biology, instead of the Division of Botany and Plant Breeding.

This came into effect from 1st September, 1980 and in this reorganisation the former Planting Division was amalgamated with the Division of Genetics, Plant Breeding and Propagation to function as a single Division.

A. Breeding and Selection

(i) Controlled Pollination

Controlled pollination work for the production of variety seednuts was carried out during the latter part of this year. It is intended to plant the proposed variety block at Bandirippuwa Estate with nine forms resulting from the above pollinations.

(ii) Pollen collection, storage and issue

The following numbers of samples were sealed and issued to the public and private sector estates for their controlled pollination programmes.

	No sealed	*No issued*
Tall pollen (prepotent)	1272	128
Dwarf pollen	156	120

In addition, 982 samples of Tall pollen were liberated within the seed garden at Ambakelle with a view to improving the quality of typica x typica and seed material.

Twenty trainees from Andigedera Estate, Janatha Estates Development Board (JEDB) were trained in the technique of controlled pollination at the request of the Regional Manager, Janatha Estates Development Board, Chilaw.

(iii) Mother Palm Seed Selection

With a view to meeting the increased demands of seednuts, "Block nut" seed selection was carried out to a larger extent throughout the year. However, mother palm seednuts were also selected on a limited scale.

A total of 3,692,086 selected seednuts, was supplied in the following manner to the nurseries :

Coconut Research Institute Nurseries

October/November, 1980	..	1,298,967
May/June, 1981	..	781,362
October/November, 1981	..	1,249,006
Total	..	3,329,335

Coconut Cultivation Board Nurseries

May/June, 1981	..	260,785
October/November, 1980	..	101,966
Total	..	362,751

Additional mother palms could not be identified during the year, due to the staff being involved with more block nut selection work. The total number of mother palms at the end of the year remained at 58,021.

B. Nurseries

(i) The following table summarizes the seednuts laid and seedlings issued at the Research Nurseries of Bandirippuwa and Ambakelle.

Nursery		Laid		
		Typica x typica	*Pumila x typica*	*King coconut*
Bandirippuwa	..	10,350	8932	5029
Ambakelle	..	5,175	—	—
			Issued	
Bandirippuwa	..	17,235	5695	578
Ambakelle	..	8,035	2473	—

(ii) Nurseries administered by the former Planting Division.
Fourteen coconut nurseries were maintained satisfactorily. Details of seednuts planted during May/June, 1980 and October/November, 1980 are given in Tabel 1.

Table 1. *Seed coconuts planted in* 1980.

Nursery	*May/June 1980*		*October/November '80*		*Total*	
	Ordinary	*Hybrid*	*Ordinary*	*Hybrid*	*Ordinary*	*Hybrid*
1. Alampil ..	—	—	150,087	—	150,087	—
2. Attavillu ..	—	—	140,265	—	140,265	—
3. Eraminigolla ..	18,450	5,701	50,550	—	69,000	5,701
4. Handapangala ..	—	—	210,495	—	210,495	—
5. Hettipola ..	25,590	—	47,000	—	72,590	—
6. Ibbagamuwa ..	149,760	—	231,145	—	380,905	—
7. Kalawewa ..	—	—	205,725	—	205,725	—
8. Kilinochchi ..	—	—	156,340	—	156,340	—
9. Kirimetiyana ..	84,215	—	165,036	—	249,251	—
10. Koggala ..	30,080	6,920	77,553	—	107,633	6,920
11. Pallekelle ..	75,000	—	119,670	—	194,670	—
12. Ratmalagara ..	150,000	—	200,019	—	350,019	—
13. Walpita ..	51,425	5,600	51,692	—	103,117	5,600
14. Wilpotha ..	100,000	—	198,133	—	298,133	—
Total ..	684,520	18,221	2,003,710	—	2,683,230	18,221

In addition, a coconut nursery consisting of various varieties of seedlings was established by this Division at the Agrarian Research and Training Institute, Colombo, Given below is the statement of seednuts planted and the number of seedlings issued for 1980 from this nursery.

Variety	*Planted*	*Issued*
Ordinary Thembili	1,051	421
Dwarf yellow x Tall	342	157
Dwarf x Tall (Hybrid)	2,205	1,185
Ordinary seedlings	2,500	500
Dwarf red	357	258
Dward green x Tall	3,207	624
Open pollinated D x T (F_2)	3,594	1,445
Total	13,256	4,590

Nursery Trials

The following nursery trials were initiated this year at the Bandirippuwa Estate nursery.

1. The use of different mulch material in the nursery for moisture conservation : Coir dust, cadjan and polythene were tried out.

2. Performance of coconut seedlings under different light intensities. This experiment is in progress and light intensities are artificially altered by the use of a cover, e. g., polythene, and by having the seedlings grown under a standing coconut plantation.

3. Effect of the densities of sowing on the dry matter production of seedlings.

4. Effect of soaking of husk on the germination of seedlings.

5. Comparison of the rates of germination of normal and husked seednuts.

All these trials were planted during the course of this year and it is premature to make any observations on these.

C. Field Experiments

(1) Intervarietal hybrids

Seven experiments at Bandirippuwa, two at Ratmalagara and seven at Pottukulama were maintained throughout the year. A significant drop in yield was observed in most experiments, due to the unfavourable climatic conditions of 1979.

Typica x Ivory Coast dwarf hybrids planted in 1975 at Bandirippuwa estate showed initial flowering. Hybrid palms in field No. 14, Bandrippuwa estate planted in 1969 showed symptoms of magnesium deficiency. A survey of affected palms was carried out and the Soil Chemist suggested the application of 2½ lb. (1.13 kg) kieserite palm with each manuring season for palms showing acute symptoms.

1. (a) F_1 Hybrids – Pottukulama Research Station

This young plantation is now eight years old. It has been reported in 1976 (Annual Report of Botanist 1976) that variety *nana*, form *regia* and *typica* F_1 hybrids show a higher yield trend for copra than variety *nana* form *pumila* x *typica* hybrids. This trend is unchanged in 1980 too as indicated in table 3.

Table 3. *Yield from F_1 hybrids (Pottukulama Research Station)* 1980 – *Block No* 10

Hybrid type	*Number of bearing palms*	*Total number of nuts*	*Total weight of husked nuts (kg)*	*Total weight of copra (kg)*	*Weight copra/nut (g)*
Form *typica* x *nana* form *pumila* ..	208	899	440.25	133.48	144.8
Variety *Nana* form *Pumila* x form *typica* ..	197	841	331.31	101.15	120.3
Form *typica* x *nana* form *regia* ..	93	431	231.25	69.51	161.3
Variety *Nana* form *regia* x form *typica* ..	303	1545	774.50	250.58	162.2

1. (b) Bandirippuwa and Ratmalagara

The hybrid coconut plantation of both locations showed a sudden drop in yield, mainly because of the adverse climatic conditions. Frequent thefts that took place in the estates also caused problems in recording data. Table 4 gives the average yield for the last 4 years on these hybrids.

Table 4. *Average yield of hybrids at Bandirippuwa and Ratmalagara in nuts per palm*

Location	*Year of planting*	1977	1978	1979	1980
Ratmalagara ..	1950	113	108	113	63
Bandirippuwa ..	1963	92	103	102	95

(ii) F_2 Progeny of F_1 hybrids

Open pollinated progenies from the F_1 hybrid plantation of Bandirippuwa Estate (Field No 14) were planted in a ten acre (4.04 ha) area of Kirimetiyana Estate, with a view to studying the pattern of segregation in the F_2 generation.

(iii) Varietal Block

Preliminary steps were taken to establish a new variety block consisting of indigenous varieties and forms. Work on pollination to produce pure planting material commenced and the field will be gradually planted with the seedlings thus produced.

(iv) Performance of hybrids under irrigation (Maha Iluppallama)

Irrigation methods in practice were continued up to the early part of the year as reported in 1979. This, however, could not be continued due to the closure of the *Yoda Ela,* the main source of water for this observation block. A complete review of the aims and objectives of this trial is proposed for 1981.

D. Seed Gardens

(1) Isolated seed garden at Ambakelle

Routine cultural operations were carried out uninterrupted. All necessary steps were taken to improve the moisture retention capacity of the soil by application of organic manure, mulching, husk burrying and growing of cover crops (*viz, Calapogonium* and *Peuraria* sp. in all fields.

Vacancies in Field No 1,2 and 3 were filled with Tall x Tall seedlings, resulting from hand pollinations done at the Second Seed Garden, Horakelley.

Emasculation Programme

The number of inflorescences emasculated between January and December, 1980 is given in Table 5.

Table 5. *Inflorescences emasculated in* 1980

Block	*No of palms*	*No of inflorescences emasculated*
5 ..	254	2060
9 ..	311	2650
10 A ..	927	6705
10 B ..	753	6838
11 A ..	553	4133
12 ..	430	2842
13 ..	182	956
14 ..	797	4067

Table 6 gives the number of dwarf nuts (hybrid) harvested from the different fields.

Table 6. *Dwarf nuts harvested in* 1980

Field No	*Dwarf green*	*Dwarf yellow*	*Total*
5	5847	—	5847
9	5314	—	5314
10 A	321	1481	1802
10 B	2771	518	3299
11 A	572	15	587
11 B	117	312	429
Total	14,942	2326	17,268

This station received 1382 mm of rainfall during the year. This has been higher than in 1979 (1161 mm) with also better distribution.

Table 7. *Crop Figures for Isolated Seed Garden Ambakelle* 1976–1980

Pick	1976	1977	1978	1979	1980	*5 year average*
1st ..	50,781	46,436	88,394	89,394	26,009	60,203
2nd ..	113,298	65,806	130,828	135,791	26,357	94,416
3rd ..	153,354	42,317	126,451	157,149	22,149	100,284
4th ..	238,577	34,164	160,375	97,407	23,707	110,846
5th ..	115,101	36,851	164,995	44,394	23,183	78,905
6th ..	47,091	49,171	113,094	37,123	44,214	58,139
Total ..	718,202	274,745	784,138	561,258	165,619	502,793

The low and unevenly distributed rainfall of 1979 would be the main contributory factor for the low yields this year.

(ii) Second Seed Garden – Horakelley

The estate received 1529 mm of rainfall during the year. Dwarf palms numbering 3327 in fields 1,3,4 and 5 were fertilised with the young palm mixture. Vacancies in field No 5 were filled with 94 dwarf red seedlings, and in fields, 1,3 and 4 with 453 dwarf green seedlings. Emasculations were carried out for the first time on 38 dwarf palms.

(E) Laboratory and other field Investigations :

(i) Conversion of floral primodia into vegetative shoots by injecting different growth hormones, into the base of the young leaf. This experiment was initiated this year in collaboration with Wye College, London and is in progress.

(ii) Five nursery trials initiated are reported under B (iii)

(F) Publications

Manthriratna, M. A. P. P. and Abeywardena, V. (1979). Planting densities and plucking systems for coconut, *Cocos. nucifera L.* 2. Study of yield characters and the economics of planting at different densities. *Ceylon Cocon. Q.* **30,** 107–115.

K. R. R. A. PERIES
Officer-in-Charge

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REPORT OF THE CHEMISTRY DIVISION – 1980

1. NUTRITION OF COCONUT USING TECHNIQUES OF TISSUE ANALYSIS

1.1. Sources of variation in leaf sampling of coconut

The study on sources of variation in leaf analysis was concluded with the following:

(a) Within and between leaflet variation

The concentration and distribution of the macronutrients within and between leaflets is shown in Table 1. The within leaflet component is highly significant for the elements N, P and K, however not significant for Ca and Mg. N, P and K concentration between the three leaf segments, base, middle and apex require that the segment for sampling be specified or alternatively, the whole leaflet be chosen if the palms are healthy.

The between leaflet variation was highly significant for all the elements except N, i.e., the N content did not vary with leaflet position.

The variation between leaflets shows K decreasing in concentration along the frond from the proximal to the distal end. Although the difference between certain leaflet positions does not reach critical differences the steady decline in concentrations necessitates care in sampling for leaf analysis. The same criterion is applicable for the elements P, Ca and Mg.

(b) Between frond variation

Tables 2 to 6 give the mean values for the macroelements in respect of all fronds sampled and the sample size within a given percentage error (with a probability of 95%).

Phosphorus and K show a steady decline in the concentration from the younger to the older fronds; Ca shows the opposite effect. These observations are in agreement with the accepted physiological principles. Magnesium remained fairly constant.

Variation in elemental concentration among fronds 13 to 16 was such that any frond could be chosen for leaf sampling. This finding makes it convenient for practical purposes to recommend sampling the 14th leaf, any error on the part of the sampler failing to identify the 14th leaf not altering the validity of the interpretation based on the frond analysis.

(c) Sample size

To minimize inherent sampling error, we attempted to ascertain the effect of the number of palms sampled on the error of the estimate and what percentage error one could allow.

If sampling is confined to leaves 13 to 16, collecting 30 palms gives an error of 2.5% of the mean for the element N and P and 7.5% for K and Ca, and 10% for Mg. This sampling procedure is sufficient for evaluating the macroelement status of the palm.

1.2. Variation in nutrient composition of leaves, kernel and nut water between harvests

A trial sampling was carried out from the Botanist's Progeny Trial at Walpita on variation in nutrient composition of the 1st and 14th leaf and the kernel and nut water from a representative sample of the nuts from each of the six harvests.

The results of the study are reported in Table 7.

It would be observed from the study that there is a considerable variation between the harvests in respect of both the leaves and nut components sampled. Therefore caution would be exercised in sampling.

In the comprehensive study on sources of variation in leaf analysis of coconut it was observed that the ideal time of leaf sampling was August-September of the year and the optimum sample size for the 1st and 14th leaf as given in Tables 2 to 6 for the macroelements.

In the context of these findings, it would be appropriate to sample the nuts of the 4th harvest and the optimum sample size for nut component analysis to be statistically obtained in a future study.

The purpose of this study is both for diagnostic purposes and relating this to quality characteristics of copra. In this study special attention will be paid to sulphur, clacium and magnesium.

1.3. Nutrient composition of varieties and hybrids

An inventory of the nutrient composition of the 1st and 14th fronds in coconut varieties and hybrids grown in Sri Lanka is being prepared.

Results of the initial studies carried out in the estates of the Institute are reported in Table 8.

1.4. Nutrient survey of coconut areas

A survey of the nutrient status of coconut growing areas using leaf analysis based on:

(a) soil type

(b) age of plantation

and (c) bearing capacity is expected to commence in 1981.

With this in view a questionnaire has been sent out to the estates confined to the Madampe region. This area has been selected as it is a high yielding area.

1.5. Injection trials on nutrient deficient palms

A balanced + all nutrient solution is being injected to several nutrient deficient palms, showing obvious multiple deficiency symptoms.

Table 1. *Distribution of nutrient elements between and within leaflets*

Source		*Mean dry weight %*				
	Position	*N*	*P*	*K*	*Ca*	*Mg.*
Between leaflets	30	2.07	0.13	1.02	0.30	0.22
	40	2.10	0.13	0.96	0.32	0.22
	50	2.06	0.13	0.90	0.32	0.23
	60	2.04	0.13	0.82	0.33	0.24
	70	2.04	0.13	0.77	0.34	0.25
Significance		N.S.	***	***	**	***
Critical difference		0.05	0.003	0.07	0.02	0.01
Within leaflets	Base	1.96	0.13	0.80	0.33	0.23
	Middle	2.08	0.13	0.92	0.32	0.23
	Appex	2.14	0.13	0.96	0.33	0.24
Significance		***	***	***	N.S.	N.S.
Critical Difference		0.04	0.001	0.05	0.02	0.01

*** p = 0.001, ** p = 0.01, * p = 0.05

Table 2. *Estimate of sample size – nitrogen*

Frond numbers	1	4	7	10	13	16	19	22
Means	1.827	2.130	2.229	2.224	2.195	1.159	2.063	1.909
Percent error of the mean								
10	—	—	—	—	—	—	—	—
7.5	6	5	3	2	3	3	5	6
5.0	13	10	7	4	5	6	11	13
2.5	51	39	26	14	19	24	43	50

Critical difference for means = 0.0912

Table 3. *Estimate of sample size – phosphorus*

Frond numbers	1	4	7	10	13	16	19	22
Means	0.166	0.167	0.165	0.162	0.158	0.157	0.151	0.139
Percent error of the mean								
10	—	—	—	—	—	—	—	—
7.5	3	3	4	3	4	3	4	4
5.0	7	6	8	6	8	7	8	8
2.5	27	24	31	24	31	25	29	29

Critical difference for means = 0.0046

Table 4. *Estimate of sample size – potassium*

Frond numbers	1	4	7	10	13	16	19	22
Means	2.372	1.907	1.682	1.488	1.346	1.251	1.258	1.202
Percent error of the mean								
10	—	—	—	—	—	—	—	—
7.5	16	17	26	24	31	33	34	40
5.0	35	37	58	54	68	73	77	90
2.5	139	145	229	216	271	292	305	359

Critical difference for means = 0.129

Table 5. *Estimate of sample size – calcium*

Frond numbers	1	4	7	10	13	16	19	22
Means	0.246	0.244	0.254	0.282	0.326	0.364	0.357	0.381
Percent error of the mean								
10	12	10	13	15	18	20	19	22
7.5	21	17	22	26	31	34	33	38
5.0	46	38	50	57	68	75	73	84
2.5	183	152	197	227	272	298	291	334

Critical difference for means = 0.0397

Table 6. *Estimate of sample size – magnesium*

Frond numbers	1	4	7	10	13	16	19	22
Means	0.228	0.233	0.223	0.213	0.225	0.239	0.233	0.223
Percent error of the mean								
10	8	11	16	23	28	29	27	36
7.5	14	18	27	40	49	50	47	63
5.0	31	40	59	88	110	113	105	141
2.5	122	158	235	352	440	449	419	561

Critical difference for means = 0.0330

Table 7. *Change in nutrient concentration of leaves, kernel and nut water between harvests (% Dry matter)*

		Jan./Feb.	*Mar/April*	*May/June*	*July/Aug.*	*Sept./Oct.*	*Nov./Dec.*
N	1st leaf ..	1.70	1.69	1.79	1.53	1.71	1.81
	14th leaf ..	2.10	2.10	2.05	1.96	2.23	2.47
	Kernel ..	0.97	1.13	0.87	0.99	1.18	1.17
	Nut-water ..	0.44	0.43	0.50	0.45	0.41	0.44
P	1st leaf ..	0.13	0.12	0.15	0.15	0.16	0.14
	14th leaf ..	0.11	0.12	0.15	0.14	0.15	0.13
	Kernel ..	0.15	0.14	0.23	0.23	0.18	0.17
	Nut water ..	0.27	0.20	0.20	0.17	0.18	0.18
K	1st leaf ..	1.93	1.70	2.30	3.00	3.05	2.28
	14th leaf ..	1.10	0.96	1.38	1.33	1.40	1.32
	Kernel ..	0.46	0.73	0.60	0.71	0.68	0.68
	Nut water ..	3.94	3.61	4.31	4.13	3.21	3.87
Ca	1st Leaf ..	0.16	0.19	0.22	0.15	0.19	0.23
	14th Leaf ..	0.26	0.29	0.32	0.29	0.28	0.31
	Kernel ..	0.01	0.01	0.01	0.01	0.01	0 01
	Nut water ..	0.74	0.63	0.41	0.55	0.72	0.75
Mg	1st leaf ..	0.19	0.19	0.22	0.19	0.18	0.16
	14th leaf ..	0.20	0.21	0.21	0.22	0.21	0.21
	Kernel ..	0.06	0.05	0.06	0.07	0.06	0.08
	Nut water ..	0.39	0.40	0.33	0.35	0.40	0.33

Observations are being kept on physical characteriatics like colour changes and leaf and inflorescence production.

1.6. Dry ashing trials on plant tissues

The optimum time for ashing and the types of vitreosil (silica) containers, crucible (platinum shaped) and basins (flat form) are being tested to enable speedy analysis of tissue samples with the available equipment in the laboratory.

We are hoping to expedite analysis of a large number of samples that are accumulating from both coconut and intercrops.

2. MICROBIOLOGY AND FERMENTATION

Studies on the succession of micro organisms during fermentation of coconut sap were completed. The fermentation of toddy was found to occur in two stages; a lactic fermentation followed by alcoholic fermentation. The study of micro-organisms from different geographical regions of the country is in progress.

2.1. Congener production in arrack

The congener levels in arrack were compared with whiskies. The isobutanol to isoamyl alcohol ratio in arrack was similar to that of whiskies. The total fusel alcohol content in arrack was lower than that of whisky. Studies on the composition of volatiles in different fractions of toddy distillate from a pilot plant pot still showed the patterns of elimination and the concentration of the congeners during the process.

Table 8. *Leaf nutrient concentration in different varieties of coconut*

Variety	*N*				*P*				*K*				*Ca*			
	L1	L6	L9	L14	L1	L6	L9	L14	L1	L6	L9	L14	L1	L6	L9	L14
San Ramon ..	1.63	2.07	2.09	2.03	0.15	0.14	0.13	0.12	2.50	1.80	1.58	1.40	0.25	0.26	0.33	0.37
Dwarf Red ..	1.68	2.04	1.95	1.94	0.13	0.13	0.12	0.12	2.00	1.55	1.40	1.24	0.20	0.24	0.24	0.30
Dwarf Green ..	1.74	1.97	2.00	2.00	0.15	0.14	0.13	0.12	2.25	1.80	1.60	1.51	0.24	0.28	0.28	0.32
Dwarf Yellow ..	1.78	2.01	1.99	1.82	0.14	0.13	0.12	0.12	1.95	1.60	1.40	1.28	0.26	0.27	0.30	0.36
Tall X Dwarf ..	2.06	2.34	2.45	2.37	0.17	0.17	0.16	0.16	2.24	1.63	1.41	1.33	0.24	0.29	0.33	0.36
Dwarf X Tall ..	1.77	2.35	2.39	2.33	0.17	0.16	0.16	2.15	2.15	1.63	1.48	0.35	0.26	0.27	0.32	0.34
King Coconut ..	1.91	1.85	2.29	2.32	0.17	0.15	0.14	0.13	2.23	1.58	1.37	1.28	0.19	0.23	0.25	0.26

	Mg			
	L1	L2	L3	L4
San Ramon	0.23	0.22	0.19	0.18
Dwarf Red	0.23	0.26	0.22	0.22
Dwarf green	0.21	0.23	0.19	0.17
Dwarf yellow	0.26	0.28	0.25	0.25
Tall X Dwarf	0.25	0.21	0.20	0.18
Dwarf X Tall	0.23	0.22	0.20	0.20
King Coconut	0.14	0.11	0.11	0.11

Some of the micro-organisms isolated from toddy were studied in a synthetic toddy medium for their ability to produce congeners. The characters in arrack could be altered by selecting the yeast combination for fermentation.

2.2. Control of microbial activity during collection of sap

The action of chemical antimicrobial agents on the different organisms fermenting toddy and foreign yeasts used for fermentations of wine was studied under local field conditions. The compounds tested showed selective activity on the microbes and were found to lose activity with time.

2.3. Energy values in coconut kernel components

Sampling methods for study of coconut kernel components for their calorific values are investigated. The variations of the readings within the parts of a kernel are less than two percent.

3. COCONUT PROCESSING

3.1. Coconut kernel

Last year (1979), initial studies on the nutrient composition of the kurumba water and kernel during the development of the coconut drupe were carried out. These studies were completed in 1980.

Subsequently, analyses of coconut milk were carried out. Coconut milk from mature kernel was extracted by methods simulating household extration procedures.

Preliminary examination showed that about 75% of the oil can be extracted by the normal household method. This efficiency could be increased by about 10% when the grated coconut kernel is first ground using a stone grinder and then hand squeezed.

3.2. Coconut sap

A method for the successful preparation of coconut wine from coconut sap has been evolved. The method has been patented and the wine is awaiting commercial production.

3.3. Coconut water

(a) *Nata-de-coco*:- In the normal preparation of *Nata-de-coco* (a jelly like dessert), 10% sugar is added to the nut water for the growth of the jelly by bacteria *Acetobacter xylinium*. Experiment has been conducted by concentrating (evaporation) a portion of the nut water (containing about 3% sugar) for the preparation of a 10% sugar solution with the idea of using this sugar solution for the preparation of *Nata-de-coco* without supplementation of sugar as usual. Preliminary results show that this could be done provided that about 20% of fresh nut water is added to the concentrated nut water.

(b) Vinegar :- Laboratory experiments have shown that vinegar of 5.7% acetic acid (marketable) could be produced by storing 30%, v/v nut water together with the coconut toddy. This experiment will be extended to a large scale production in 1981.

M. JEGANATHAN
Acting Head

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REPORT OF THE CROP PROTECTION DIVISION – 1980

The Black Beetle – *Oryctes rhinoceros*

During the early part of the year several black beetle monitoring traps were established at a number of localities in the Eastern Province. The attractant used in the traps was Ethyl Chrysanthemumate. As the year progressed increasing activity of the pest was noticed.

A survey carried out during the middle of the year indicated the increased damage caused to the newly-planted seedlings in the Eastern Province. A preliminary survey revealed that almost all coconut palms felled during the cyclone harboured the pest. In some localities, at least two generations had passed in the logs. The problem is aggravated by the use of untreated coconut logs as fence posts. These are ideal breeding grounds and have significantly contributed to the present pest position in the area. Unless action is taken to destroy these logs, the Black Beetle problem will be very acute in 1981 causing a serious threat to the establishment of the newly-planted seedlings. In the interest of the East Coast Rehabilitation Programme, it is necessary to remove the Black Beetle breeding grounds from this area. Perhaps a government grant for this purpose would be most useful.

A field trial started at Wennappuwa to test the efficiency of three commonly available organochlorine compounds as repellants progressed satisfactorily. Monthly observations were recorded during the year under review. Preliminary analysis indicated that BHC dust gave longer protection to seedlings than either of the other two insecticides tested *viz.*, Aldrin dust and Aldrin EC. The results of this experiment will be available during mid 1981.

The Coconut Caterpillar – *Nephantis serinopa*

Pest position in 1980

The Pest remained a problem in certain holdings in Vitarandeniya area. Some of the estates belonging to the Land Reform Commission harboured the pest throughout the year. Control achieved in these estates was very unsatisfactory owing to the apparent inaction on the part of the Superintendents.

Satisfactory control was achieved in almost all other holdings by regular release of parasites.

In some localities, the control strategy had been the judicious use of insecticides and parasites. Spraying of insecticides was resorted to only in instances where the pest population was very high and the parasite populations remained very low or were absent. This was first verified by a series of pest/parasite population studies. Subsequently about 100 acres of coconut land in the Vitarandeniya area were sprayed.

In addition to the Southern Province, an outbreak of the pest occurred in Udappuwa area (Puttalam District). Here, successful control was achieved by using insecticides and parasites. The trials carried out there indicated the greater effectiveness of Carbaryl over the hitherto used Dipterex EC 50 as an insecticide for the control of coconut caterpillar.

On the east coast, a mild infestation of this pest was recorded at Urai and prompt action was taken to cut and burn the affected fronds. The infestation was thus brought under control.

The infestations reported in the annual report for 1979 at Chilaw and Ja-Ela were under complete control by the end of the first quarter of 1980. The area was, however, kept under surveillance to monitor the pest situation.

Biological Control Programme

The Parasite Breeding Station at Mylambavely which was extensively damaged by the cyclone did not function fully. As the coconut caterpillar was detected only in small numbers, parasite breeding work was also restricted.

The Insectary at the headquarters functioned smoothly, and the following parasites were bred :

Perisierola nephantidis

Eriborus trochanteratus

Bracon brevicornis

Trichospilus pupivora

In the Chilaw area, *Bracon brevicornis* was found to be effective and its laboratory breeding was commenced in May.

The number of parasites released in different provinces is given in Table 1.

Table 1. *Release of Parasites* 1980

Province	*No of parasites*			
	Perisierola	*Eriborus*	*Bracon*	*Trichospilus*
North-Western	3750	900	1500	100
Western	17350	1725	7700	28500
Southern	144250	2100	49000	115600
Eastern	12000	—	—	—
Northern	750	—	1000	—

Work on systemic insecticides

Field studies were conducted at Udappuwa (Puttalam district) in a coconut caterpillar infested land using bioassay analysis on the new technique for systemic insecticide monocrotohos application through petiolar wells. Results of these studies were satisfactory and further work is in progress.

The Coconut Scale – *Aspidiotus destructor*

During the year under review, two minor outbreaks of this pest were reported. In both these localities the pest was brought under control by naturally-occurring parasite, *Aphytis chrysomphali* and predators, *Pullus xerampelinus* and *Chilocorus nigritus.*

The Red Weevil – *Rhyncophorus ferrugineus*

Several reports of this pest were received and these were referred to the Coconut Development Officers for inspection and advice. The pest attacked several adult palms of about 25 years at Bandirippuwa Estate where it was found that the pest had gained entry through injuries caused by the carelessness of toddy tappers.

Promecotheca cumingi

This pest, which devastated about 3000 ha in Galle area, was under complete control. The pest did not appear in significant numbers in any of the areas in the Galle district. However, our programme of surveillance was continued until the end of the year. By mid 1980, the coconut palms were totally free of the pest.

A field trial was initiated in Galle to study the effect of *Promecotheca* attack on the yield of coconut palms. The button nut formation in a number of selected trees which were badly attacked by the pest was monitored throughout the year.

Biological control of *Chromolaena odorata*

The defoliator insect, *Ammalo insulata* was found to be established in almost all the areas of Sri Lanka.

A field study at Malwana was continued during the year. The results of this experiment (Mahindapala, 1980) indicate the importance of larval mortality in the field.

The Coconut Research Institute entered into a research contract with the International Atomic Energy Agency to study some of the field problems of this biological control programme using radio isotopes. However, no significant progress on this programme could be made as the equipment requested did not arrive in time. In this connection Dr. G. C. La Brecque of the Agency visited the Institute in September.

Other experiments

The field experiment at Bandirippuwa Estate to evaluate crop loss due to insect damage progressed smoothly. The insect damage was simulated by artificial defoliation and records of yield, nut production etc were kept during the year under review.

Diseases

(i) **Bud Rot:** Only a few reports of the occurrence of this disease were received. An outbreak of the disease at Nalawalana during the latter part of 1979 (Mahindapala, 1979) appeared controlled.

(ii) **Stem Bleeding and Leaf Blight:** Several reports of this disease were received during the year under review. These were referred to the Coconut Development Officers for inspection and advice.

(iii) A leaf disease of coconut caused by *Curvularia* sp. was recorded for the first time in Sri Lanka. It was noted in several coconut nurseries.

A joint study with the Department of Biological Sciences of the Sri Jayawardenapura University was undertaken to study the biology of the causal fungus.

Soil Microbiology

Studies in soil microflora were carried out during the year under review. The results of this study will be reported elsewhere.

Lectures, Seminars and Publications

Mr. S. M. P. Subasinghe, Extension Officer, conducted several lectures on pest and disease control in coconut to various groups of people who visited the Institute to learn about coconut cultivation.

Papers read

Mahindapala, R. Some studies on the biological control of *Chromolaena odorata*. Read at the Annual Sessions of the Sri Lanka Association for the Advancement of Science, 1980.

Perera, P. A. C. R. The biological control of *Chromolaena odorata*. Read at the IAEA/FAO research co-ordination meeting in Jakarta, Indonesia. September, 2 – 5.

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Fernando, P and Mahindapala, R. (1977). Leaf Blight disease of coconut (i). Studies on *Pestalozzia palmarum*, *Ceylon Cocon. Q.*, **28**, 73–80.

Sinnatamby, S. V. (1977). Studies on the biology of *Pullus xerampellinus* Muls. (Col: Coccinelidae) a predator of *Aspidiotus destructor* Sign. (Hom: Coccidae), with a note on its parasite. *Ceylon Cocon. Q.*, **28**, 81–88.

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Mahindapala, R. (1979). *Curvularia* leaf spot of coconut to *Ceylon Cocon. Q.*, **30**.

Mahindapala, R. and Subasinghe. S. M. P. (1979). Damage to coconut by *Meredolus* (Col: Curculionidae). *Ceylon. Cocon. Q.*, **30**.

Sinnatamby, S. V. (1980). The behaviour of *Aphytis chrysomphali*, a hymenopterus parasite of the coconut scale, *Aspidiotus destructor* in Sri Lanka. *Ceylon Cocon. Q.*, **31**.

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Mahindapala, R. (1980). Some studies on the biological control of *Chromolaena odorata*. Read at the Annual Sessions of the Sri Lanka Association for the Advancement of Science, 1980.

R. MAHINDAPALA
Head

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REPORT OF THE SOIL SCIENCE DIVISION – 1980

A. FIELD EXPERIMENTS

1. 4 X 4 X 4 NPK experiment on adult palms – Bandirippuwa Estate, Lunuwila (commenced November 1960)

The experiment was modified in 1979.

Copra yields for the periods 1963–1966 (Period I), 1967–1970 (Period II), 1971–1974 (Period III) and 1975–1978 (Period IV) were statistically analysed. Copra yields for each of these periods were significantly correlated with soil depth which varied from 30 to 200 cm in the experimental block. The coefficient of determination of the production function relating copra yields to N, P and K treatments improved when the yield data were corrected for soil depth rather than when adjustments were made for pre-experimental yield.

The critical soil depth for coconut under Bandirippuwa conditions appears to be around 125 cm.

The main effects of fertilizers on copra yield for the four periods are shown in Table A1. Muriate of potash linearly increased copra yield. Saphos phosphate had a slight positive effect on yield whereas sulphate of ammonia had no significant main effect. A close to significant positive NK interaction on yield was also observed (Table A 2).

Table A1. *Main effects of fertilizers (kg copra/ha/yr)*

	63–66	*Difference*	67–70	*Difference*	71–74	*Difference*	75–78	*Difference*
N_0 ..	1835	—	1517	—	1311	—	990	—
N_1 ..	1914	79	1569	52	1308	–3	915	–75
N_2 ..	2014	179	1633	116	1364	53	942	–48
N_3 ..	2079	244	1609	92	1375	64	992	2
P_0 ..	1955	—	1469	—	1140	—	789	—
P_1 ..	2012	57	1590	121	1370	230	1002	213
P_2 ..	1959	44	1631	162	1427	287	1042	253
P_3 ..	1918	–37	1639	170	1420	280	1006	217
K_0 ..	1746	—	1314	—	1029	—	616	—
K_1 ..	1931	185	1543	229	1274	245	840	224
K_2 ..	2069	313	1703	389	1479	450	1113	497
K_3 ..	2097	351	1767	453	1575	546	1219	603

Where

N_0	.. Okg	Sulphate of ammonia/palm/year
N_1	.. 1.103	,,
N_2	.. 2.206	,,
N_3	.. 3.309	,,
P_0	.. Okg	Saphos phosphate/palm/year
P_1	.. 0.826	,,
P_2	.. 1.652	,,
P_3	.. 2.478	,,
K_0	.. Okg	Muriate of potash/palm/year
K_1	.. 0.376	,,
K_2	.. 0.752	,,
K_3	.. 1.128	,,

Table A2. *N – K Interaction (kg copra/ha/yr)*

		N_0	N_1	N_2	N_3
	1967 – 1970				
K_0	.. ..	1379	1268	1352	1265
K_1	.. ..	1510	1571	1583	1510
K_2	.. ..	1574	1671	1821	1748
K_3	.. ..	1608	1769	1779	1913
	1971 – 1974				
K_0	.. ..	1188	970	1010	946
K_1	.. ..	1293	1297	1290	1216
K_2	.. ..	1347	1406	1605	1560
K_3	.. ..	1415	1558	1551	1777
	1975 – 1978				
K_0	.. ..	758	541	571	595
K_1	.. ..	944	887	874	860
K_2	.. ..	1073	1035	1180	1164
K_3	.. ..	1186	1198	1143	1347

2. 3 X 3 X 3 NPK experiment on young palms-Ratmalagara Estate, Madampe (commenced December 1948)

The experiment was modified in 1979. The second manuring according to the modified treatments was done in October 1980.

3. 4 X 4 X 4 NPK experiment on young palms – Pothukulama Research Station, Pallama (commenced December 1960).

Annual application of fertilizer was done in November 1980.

Several palms (about 7%) in the experimental block showed symptoms of "Leaf Scorch Decline." A census of the "Leaf Scorch" affected palms was taken towards the end of the year. Statistical analyses showed that there is no relation between fertilizer treatments and the occurrence of "Leaf Scorch". Soil pH in the manure circle varied from 4.0 to 6.5. Soil pH too had no relation to the occurrence of "Leaf Scorch". It is proposed to commence an Interdisciplinary research project on "Leaf Scorch" in this block in 1981.

4. 5X5X5X5 NPK Mg experiment on adult palms – Marandawila Estate, Bingiriya (commenced November 1967).

The experiment was closed down at the end of 1980. Response to nitrogen was significant at P 0.05. A close to significant response to phosphorus was also obtained.

Table A 3. The main effects are:

	Treatment/palm/yr		*kg/copra/ha*	% *kg copra/ha*	*Difference*
N_0	0.000 kg ammonium sulphate	..	1125	100	—
N_1	1.103 „	..	890	79	-235
N_2	2.206 „	..	745	66	-381
N_3	3.309 „	..	688	61	-437
N_4	4.412 „	..	721	64	-405
P_0	0.000 kg saphos phosphate	..	721	100	—
P_1	0.826 „	..	728	101	+6
P_2	1.652 „	..	784	109	+62
P_3	2.478 „	..	890	123	+69
P_4	3.304 „	..	1146	159	+325
K_0	0.000 kg muriate of Potash (60% K_2O)	..	823	100	—
K_1	0.454 „	..	861	105	+38
K_2	0.908 „	..	866	105	+43
K_3	1.362 „	..	639	102	+16
K_4	1.816 „	..	780	95	+43
Mg_0	0.000 kg kieserite „	..	715	100	—
Mg_1	0.681 „	..	889	124	+174
Mg_2	1.362 „	..	948	133	+234
Mg_3	2.043 „	..	893	125	+179
Mg_4	2.724 „	..	724	101	+10

5. Comparison of Eppawala apatite with saphos phosphate – Mahayaya Estate, Makandura and Andigedera Estate, Bingiriya (commenced June 1975).

In both experiments, application of fertilizers was done in November, 1980.

6. Magnesium experiment on young palms – Bandirippuwa Estate, Lunuwila (commenced October 1972).

Due to dry conditions in late December manuring was not done during the year 1980.

The percentage of palms in flower by the end of 1980 is given below.

	Mg_0	*Mg_1*	*Mg_2*
T X T	52.8	80.6	75.0
T X D	69.4	80.5	88.9
D X T	72.2	88.9	77.8
OP	47.2	58.3	77.8

Statistical analysis of the data is in progress.

7. Fertilizer experiment on young hybrid palms -- Bandirippuwa Estate, Lunuwila (commenced December 1973).

The annual manuring was done in October 1980.

The composition of the fertilizer mixture was 113.5 kg ammonium sulphate, 34 kg saphos phosphate and 56.8 kg muriate of potash (60% K_2O). The rates of application were

Levels	*kg/seedling/year*
0	0.00
1	2.72
2	5.44
3	8.17

To the end of 1979 the flowering data (based on plots unaffected by water logging) are as follows

	Control	*Level* 1	*Level* 2	*Level* 3
Average per plot (12 palms/plot) ..	7	9	12	10.5
%	58	75	100	88

8. Chlorine experiment at Ratmalagara Research Station, Madampe (commenced June 1977).

The annual manuring was done in July 1980.

9. 3X3 NK experiment at Kobeigane Estate, Hettipola (commenced December 1978).

Significant response to N at P=0.001 was obtained. The yield data for 1980 are shown in Table A 4.

Table A 4. *Effects of N and K on nut yield (nuts/ha/yr – 160 palms/ha)*

kg sulphate of ammonia palm/yr	*kg muriate of potash* (60% K_2 0) *palm/yr*		
	0	1	2
0 ..	10000	9460	10880
1 ..	11440	11000	10000
2 ..	12340	12520	11440

10. Experiment on ammonium chloride, ammonium sulphate and urea at Manakkulama Estate, Kakkapalliya (commenced July 1976).

The annual manuring was done in December 1980.

11. Comparison of saphos phosphate and concentrated superphosphate at Pallai (commenced July 1977).

The annual manuring which was due in December 1980 was done in January 1981.

The yield data (nuts/ha/yr) for the period, June 1979 to April 1980 are given below.

*Treatment**	*Block I* (158 *palms/ha*) (*Square plantation*)	*Block II* (178 *palms/ha*) (*Triangular plantation*)
Control (no P)	5972	3997
Saphos phosphate (0.83 kg/palm/yr)	6209	3271
Concentrated superphosphate (0.54 kg/palm/yr)	7568	3666

12. Magnesium deficiency in coconut at Bandirippuwa Estate.

Magnesium deficiency was observed during early 1980 in some coconut palms in the hybrid comparison block (Block No. 13 and 14) of the Division of Botany at Bandirippuwa Estate.

Division of Botany was advised to apply kieserite to the whole block and skip application of NPK fertilizers for one year. 2% $MgSO_4$ solution was sprayed using a power sprayer to four acutely deficient palms at the rate of 2 gallons/palm in August 1980. 6th and 10th leaves were sampled from 10 affected trees at three sites and analysed for N, P, K, Ca and Mg.

Leaf Number	*Site*	*% N*	*%P*	*%K*	*% Ca*	*% Mg*
6 ..	1	2.37	0.172	1.797	0.236	0.227
	2	2.44	0.181	1.931	0.289	0.167
	3	2.21	0.172	2.008	0.385	0.092
	1	2.23	0.163	1.330	0.413	0.075
14 ..	2	1.93	0.138	1.427	0.288	0.075
	3	2.16	0.162	1.602	0.343	0.108

The results showed high levels of N, P, K, moderate levels of Ca and very low levels of Mg in the leaves.

Soil samples collected from the centre of squares in the affected area also showed very low levels of available Mg.

Severely affected palms were sprayed with $MgSO_4$ again in October 1980. Photographs were taken before and after these treatments. Palms are recovering.

13. Boron deficiency in coconut – Poojapitiya, Kandy (commenced October 1979).

About 15 two to three year old coconut palms in a home garden at Poojapitiya, Kandy had short, crinkled leaves with withered cabbages. The symptoms appeared to be due to Boron deficiency. The texture of the soil is loam. The land is intensively cultivated with tea and pepper. Tea and pepper did not show any visible B deficiency.

Affected palms were divided into three categories depending on the intensity of symptoms. Palms were selected randomly and the soils were treated with sodium tetraborate at the rates of 0, 28 and 56 g/palm. Recovery of palms was carefully observed periodically and colour photographs were taken. Leaf (3rd) and soil samples were collected and analysed for B. In order to compare the B levels in tea bushes in the vicinity, tea leaf (bud, 3rd and mature) samples were collected and analysed.

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* A basal treatment of 1.1 kg urea and 1.36 kg muriate of potash/palm/yr was given to all palms.

At the end of 4 to 5 months after soil application of B the condition of the affected palms improved. At the end of 8 months the palms were completely recovered. The untreated palms showed acute deficiency symptoms with time and ultimately died.

B. POT EXPERIMENT.

1. Glasshouse study on the performance of Eppawala apatite

The Eppawala apatite (EA) was fused with serpentine to form a fused magnesium phosphate (FMP). This fused product supplied by the State Mining and Minera Corporation was compared with saphos phosphate (RP) and Eppawala apatite (untreated).[1] A sandy soil from the block adjoining the nursery at Bandirippuwa was used. Each pot contained 2000 g of soil. The test plant was *Paspalum commersonii.*

Two levels of each fertilizer replicated thrice were tested. Two harvests, one at 63 days and the other at 103 days were taken.

At the first harvest all three sources produced significant response over the control at level 1(L1), the performance of all three sources being nearly the same. At level 2(L2) only RP and FMP gave significant response over the control. At this level FMP was superior to both EA and RP. Both EA and RP produced diminishing returns while FMP showed a linear response.

At the second harvest, the response, at both levels, of all 3 sources over the control was significant. The response of FMP was linear and that of EA and RP was diminishing. At L1 no significant difference in response was noted between the sources. At L2, FMP was significantly superior to both EA and RP and the last was better than EA.

	Source		*Treatment g/pot*	*Mean dry matter weight g/pot*	
				1st harvest	*2nd harvest*
	Control	..	0	1.8	0.6
Level 1	EA	..	4.0	3.9	3.3
	RP	..	2.0	4.7	4.3
	FMP	..	1.0	3.9	4.5
Level 2	EA	..	8.0	2.6	2.0
	RP	..	4.0	3.2	3.9
	FMP	..	2.0	5.0	6.2

C. LABORATORY INVESTIGATIONS

1. Extractable micronutrients in some sandy soils of Sri Lanka and their availability to coconut

Samples of soils belonging to the Great Soil Group, "Regosol" were collected from twelve sites in the major coconut growing areas in Dry, Intermediate and Wet zones of Sri Lanka and the available Fe, Mn, Zn, Cu and B were determined. Six extractants 1M NH_4OAc (pH 7), 1M NH_4OAc (pH 4.8), 0.1M HCl, 0.05 M HCl, + 0.0125 M H_4SO_4, 0.02 M EDTA, 0.02 M EDTA + 0.5 M NH_4OAc (pH 4.65) were used to determine available Fe, Mn, Cu and Zn. "Easily reducible" Mn and available B were extracted by hydroquinone and hot water respectively. Total amounts of the five micronutrients were also determined.

Leaf samples from the 1st, 6th, 10th and 14th leaves were collected from 10 palms in each of the twelve sites and the micronutrient concentrations were determined.

The soils were generally high in extractable Fe and deficient in Cu. Mn concentrations were also high, except in the two high pH soils. Boron and Zn concentrations ranged from low to high levels. Concentrations of the nutrients in the leaf followed generally the same pattern as in the soils.

Correlations of extractable soil nutrients and leaf nutrients indicated that acid extractable Fe, hydroquinone extractable Mn and EDTA extractable Zn were significantly related to the respective nutrient concentrations in the 14th leaf.

Concentrations of Fe, Mn and Zn in leaf increased and those of Cu decreased with the maturity of the leaves. Boron concentrations did not change significantly with the age of the leaves.

Acid and EDTA extractable forms of Fe and Zn decreased with increase in soil pH but total and hot water extractable B increased with soil pH. Organic carbon increased exchangeable Cu, Fe and hot water extractable B. NH_4OAc extractable Cu and Zn had negative correlation with % clay, whereas Mn extracted by most extractants including NH_4OAc had positive correlations.

The results were presented at the 1980 Annual Sessions of the Sri Lanka Association for the Advancement of Science (SLAAS)*.

2. Relationships between coconut yield, leaf nutrient concentrations and fertilizer treatments

The above relationships were obtained from three fertilizer field experiments conducted at Pallama, Madampe and Veyangoda. The data showed that application of sulphate of ammonia generally increased leaf N and decreased leaf K and Cl; saphos phosphate increased leaf P, Ca and Mg and at Madampe, in addition, decreased leaf K and Cl. Muriate of potash increased leaf K and Cl and decreased Ca and Mg.

Veyangoda – lateritic gravels – adult palms

Fertilizer treatment	*Leaf nutrients*					
	N	*P*	*K*	*Ca*	*Mg*	*Cl*
SA ..	+(NS)	0	-(NS)	0	0	—
SP ..	0	++	0	+	0	0
MP ..	0	0	+++	—	—	+++
Madampe – lateritic gravels – young palms						
SA ..	—	0	———	0	0	-(NS)
SP ..	+(NS)	+++	———	+++	—	———
MP ..	-(NS)	0	+ + +	-(NS)	———	+++
Pallama – sandy soils – young palms						
SA ..	+(NS)	0	0	+	0	0
SP ..	0	+++	+(NS)	—(NS)	+	0
MP ..	+(NS)	0	+++	0	———	++—

* Sri Lanka Association for the Advancement of Science.

+, ++, +++, positive effect, significant at p=0.05, 0.01 and 0.001 respectively.

—, --, ---, negative effect significant at p=0.05, 0.01 and 0.001 respectively.

— (NS), - (NS), close to significance at P=0.050, not significant.

Application of muriate of potash increased yield at all three sites. Saphos phosphate increased yield only at Madampe and Pallama and sulphate of ammonia had no significant main effects at any of the sites. Yield at Veyangoda was positively correlated with leaf K and Cl and negatively with leaf Mg. Yield increase due to P application at Madampe was positively related to leaf P and Ca and negatively to K and Cl and at Pallama it was related positively to leaf P, Ca and Mg and negatively to N. Yield increase due to K application at Madampe and Pallama was positively correlated to leaf K and Cl and negatively to leaf Ca and Mg.

The "sufficient range" of nutrient concentrations (% in 14th leaf) for coconut are, N, 1.9 to 2.1; P, 0.11 to 0.12; K, 1.2 to 1.4; Ca, 0.35 to 0.45; Mg. 0.29 to 0.30 and Cl, 0.30 to 0.35.

The results were presented at the 1980 Annual Sessions of the SLAAS.

3. Downward movement and transformation of phosphorus in soil columns using P-32

The study is a follow-up of the work carried out on the downward movement and transformation of phosphorus in the field at Pothukulama Research Station (Annual Report of the Division of Soils for 1976).

The field experiment at Veyangoda showed no response to saphos phosphate applications whereas at Bingiriya, saphos phosphate significantly increased yield. To understand the difference in the behaviour of the phosphorus fertilizer in the two areas a laboratory experiment was commenced using P-32.

Soil samples from Veyangoda (Naiwala estate) and Bingiriya (Marandawila estate) were packed in soil columns and kept at field capacity moisture level. At the end of two days 5 ml of P-32 labelled phosphoric acid was added at the top of the soil columns. Distilled water was added in instalments of 71 ml upto 1415 ml equivalent to 200 cm of rain water. At the end of two weeks each column was allowed to dry and cut into 6 equal portions of 5 cm each. P-32 was extracted from these portions by Bray + Kurtz's No. 1 method. P-32 fractions associated with Al, Fe, Ca and total P-32 are being determined.

4. Soil, leaf and fertilizer analyses

Several samples of soil, leaf and fertilizers were analysed for the Coconut Cultivation Board, the Ceylon Fertilizer Corporation and private coconut growers.

D. SOIL SURVEY

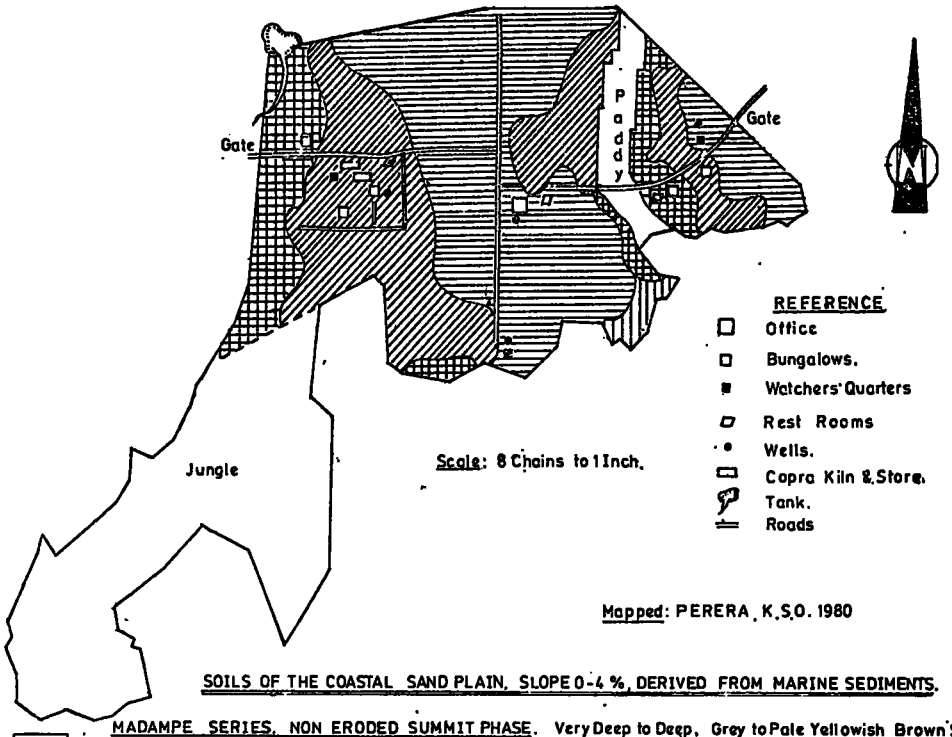
(This section was submitted by Mr. K. S. O. Perera).

1. Soil survey of Research Stations

(a) Pothukulama Research Station

This station is located on the border between the agroclimatic semi-dry and the semi-wet lowlands.

SOIL MAP OF THE POTTUKULAMA RESEARCH STATION



Mapped: PERERA, K.S.O. 1980

SOILS OF THE COASTAL SAND PLAIN, SLOPE 0-4 %, DERIVED FROM MARINE SEDIMENTS.

MADAMPE SERIES, NON ERODED SUMMIT PHASE. Very Deep to Deep, Grey to Pale Yellowish Brown Soils. Surface Sands Grading Downwards to Loamy Sands, Sandy Loams, Sandy Clay Loams. Moderately Well to Imperfectly Drained.

MADAMPE SERIES VERY SLIGHTLY TO SLIGHTLY ERODED MID SLOPE PHASE. Deep to Moderately Deep. Greyish Brown to Yellowish Brown soils, Loamy Sands or Sandy Loams Grading Downwards to Sandy Clay Loams. With a Gravel Hard Pan at 35"-45", Imperfectly Drained.

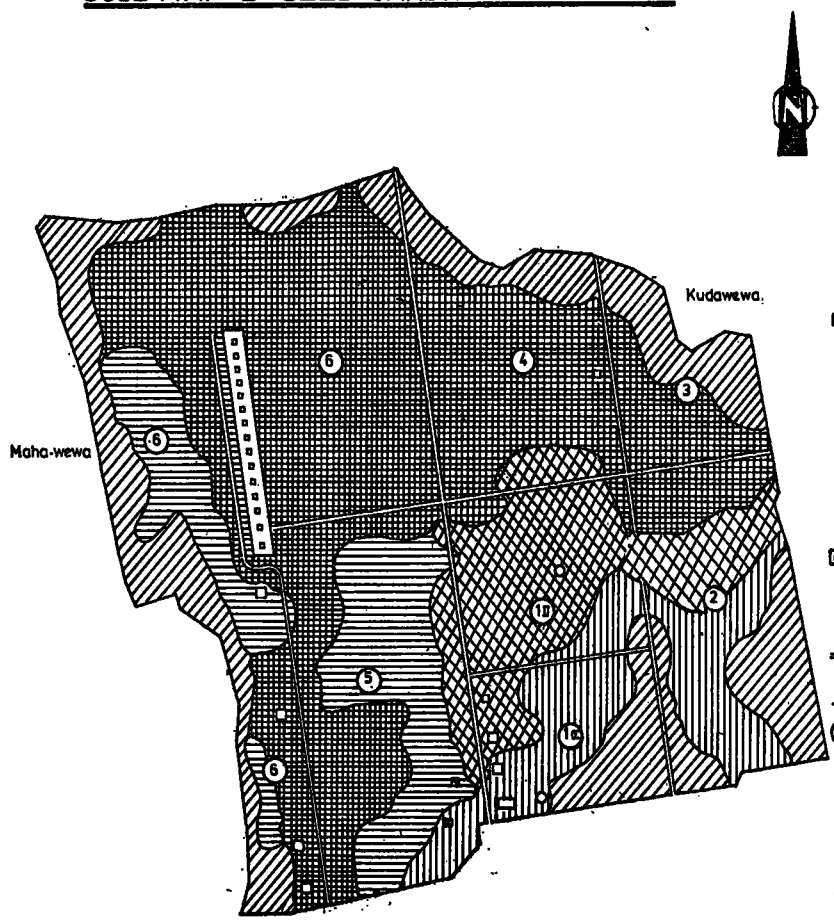
MADAMPE SERIES MODERATELY TO STRONGLY ERODED BOTTOM SLOPE PHASE. Moderately Deep to Shallow, Dark Yellowish Brown Soils. Sandy Clay Loams With a Gravel Hard Pan at 10" to 35". Imperfectly Drained.

SUDU SERIES ON BOTTOM SLOPES. Deep, Light Grey, Fine to Coarse Sand, Imperfectly to Poorly Drained.

Acknoledgements For Field Assistance,
D.S.Wijayatunge.
P.J.E.Fernando.

Cartography: D.S. Wijayatunge.

SOIL MAP- 2nd SEED GARDEN HORAKELLE.



Scale: 5 1/3 Chains. To 1 Inch.

Mapped: Perera. K. S. O. 1980.

ORIGIN : MARINE.

RECENT SAND PLAIN. DEPOSITED ON SLOPES OF BURIED OLDER SAND PLAIN.

LOWER SLOPES- Sands, White, Very Deep, Well-Drained.

MID SLOPES - Sands, Light Grey, very deep At Depth Loamy Sands, Light Yellowish Brown, Well Drained.

UPPER SLOPES- Sands, Light Yellowish Brown, very deep At Depth Loamy Sands, Dark Yellowish Brown, Well-Drained.

OLDER SAND PLAIN.

UPPER BEACH TERRACE - Loamy Sands, very deep Dark Red To Dark Yellowish Brown, Well Drained.

LOWER BEACH TERRACE.- Loamy Sands, very deep Dark Yellowish Brown, Well Drained.

Cartography: D.S. Wijayatunge.

Field Assistance:-
D.S. Wijayatunge.
P.J.E. Fernando.

The following soils were identified

(i) **Madampe series - uneroded summit phase**
Very deep to deep sands, grading downwards to loamy sands, sandy loams and sandy clay loams. The soils are well drained.

(ii) **Madampe series – very slightly to slightly eroded, midslope phase**

In the higher midslopes, the surface sand has been removed by erosion. In the lower-midslopes, the loamy horizon has been removed. The soils are deep to moderately deep, passing to a strongly compacted horizon of ferruginous gravels resting on a lateritic basement. The soils are well drained.

(iii) **Madampe series – moderately to strongly eroded bottom slope phase**

The upper horizon has been removed by strong erosion leaving a sandy loam to sandy clay loam surface which passes to a horizon of sandy clay loam with 5 to 10% gravels forming a hard pan. The soils are shallow to moderately deep, well drained.

(iv) **Sudu series:** These are deep imperfectly drained sands.

2. Soil survey of Seed Garden, Horakelle.

The land is situated in the semi-wet lowland. The water table during the dry period is around 15 feet.

The following soils were identified

(a) Soils of the recent sand plain

(i) **Lower slopes:** These are white, deep, coarse sands and well drained.

(ii) **Midslopes:** These are deep light gray sands, passing to loamy sands. The soils are well drained.

(iii) **Upper slopes:** Light yellowish brown deep sands passing at depths to dark yellowish brown loamy sands. The soils are well drained.

(b) Soils of the older sand plain

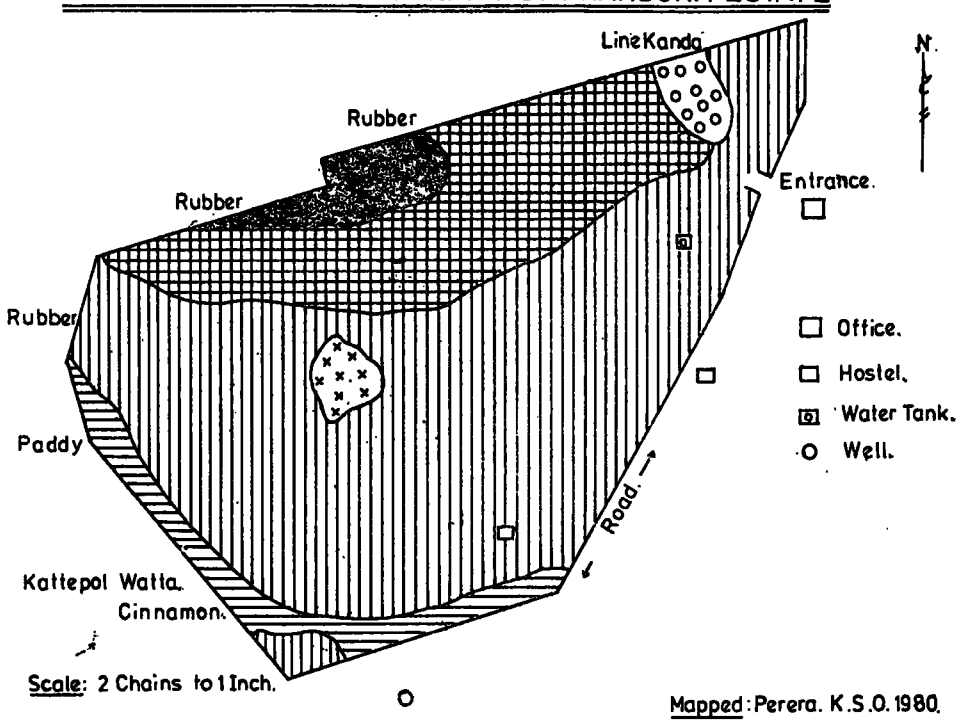
The older sands of a former shore line have probably formed an upper beach terrace and a lower beach terrace.

(i) **Upper beach terrace:** These are dark red to dark yellowish brown deep loamy sands. The soils are well drained.

(ii) **Lower beach terrace:** These are dark yellowish brown, deep, loamy sands, slightly moist at depth.

As the soils are coarse textured without any impeding layer and the water table is not deep, the roots of adult palms of age about 5 years and more could utilize the underground water. Therefore these palms are not expected to suffer seriously from moisture stress during drought periods.

INTERCROPPING EXPERIMENT. SIRIKANDURA ESTATE



LATERITIC SOILS.

1. Yellowish Red Sandy Clay Loam. on sandy clay, few coarse gravels, deep, well drained.

2. Similar to 1. But dark yellowish brown with gravel hard pan. shallow, well drained.

3. Similar to above, But includes a very shallow stony phase, well drained.

4. Light grey, fine sandy clay loam on gravel hard pan, deep to moderately deep Well to imperfectly drained.

QUARTZITIC SOILS

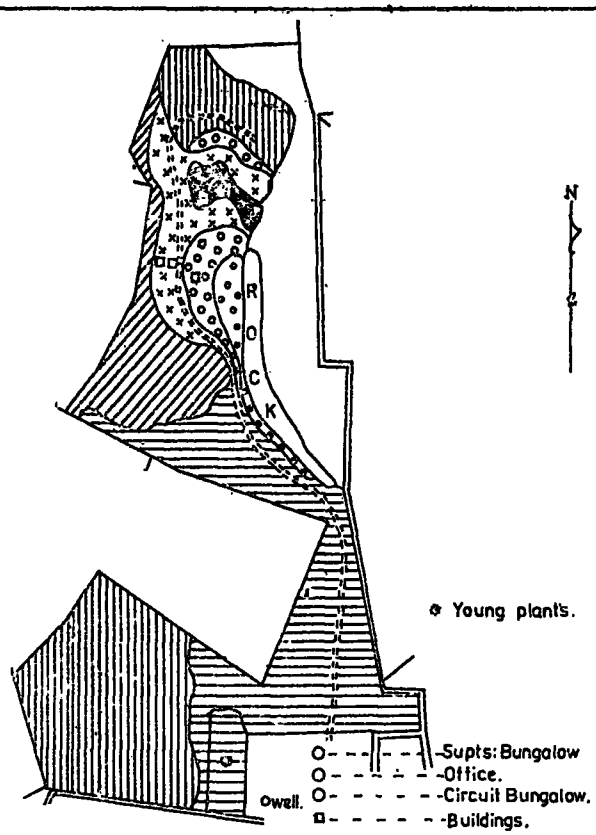
5 Yellowish red, sandy clay loam with fine to medium quartz gravels, Deep, well drained.

MODEL SOILS

6. Dark brown sandy clay loam passing to brownish yellow coarse sandy clay loam. With quartz and iron stone gravels deep well to moderately well drained.

Cartography: D.S. Wijayatunge.

SOIL MAP PASEKUDAH



Scale. 8 Chains to 1. Inch (approx).

Mapped: Perera. K.S.O. 1980.

SOILS OF THE MARINE PLAIN.

BEACH TERRACE.- Dark yellowish brown loamy sands, passing to sandy loams, deep, well drained.

BEACH PLAIN.- Light yellowish to reddish yellow sands. deep, well drained.

ERRODED TERRACE.- Light yellowih brown sands, passing to loamy sands on gravel pan or hard sandy clay pan. moderately deep to deep impertect to moderately well drained.

SOILS OF THE LAGOON PLAIN.

Very dark grey passing to pale brown loamy sands with slight calcarious matter, deep well drained. lagoonal model.

Very dark grey loamy sands passing to light yellowish highly calcarious sands on calcarious hard pan, deep, well drained. lagoonal.

SOILS OF THE RIDGE

SUMMIT PHASE - Dark yellowish brown fine sandy clay on gravel hard pan. shallow well drained derived from quartz feldspar rocks.

SLOPING PHASE - Similar to above, moderately deep, well drained.

Cartography: D.S. Wijayatunge.

3. **Soil surveys for field experiments of the Agronomy Division**

(a) Sirikandura estate, Dodanduwa

The area lies in the wet lateritic lowland. The following three major categories were identified (Descriptions are given in the map).

(i) Lateritic soils

(ii) Quartzitic soils

(iii) Modal soils

(b) Pasikudah estate, Kalkudah for the Eastern Province Rehabilitation Project

The area lies in the dry lowland.

Three categories of soils were identified (Descriptions are given in the map).

(i) Soils of the marine plain

(ii) Soils of the lagoon plain

(iii) Soils of the ridge

4. Soil surveys were carried out for the selection of suitable lands for new coconut plantation in the Districts of Hambantota, Ratnapura, Monaragala and Polonnaruwa. This work was done under the Development Projects of the Coconut Development Authority.

E. MISCELLANEOUS

The following papers were published in scientific journals or presented at scientific meetings :

1. Loganathan, P. and Fernando, T. W. (1980). Phosphorus sorption by some coconut-growing acid soils of Sri Lanka and its relationship to selected soil properties. *J. Sci. Food Agric.*, **31**, 709 – 717.

2. Loganathan, P. and Balakrishnamurti, T. S. (1980). Effects of NPK fertilizers on young coconut (*Cocos nucifera*) on a sandy soil in Sri Lanka. *Expl. Agric.*, **16**, 41–48.

3. Loganathan, P. and Atputharajah, P. P. (1980). Relationships between coconut yield, leaf nutrient concentrations and fertilizer treatments. Paper presented at the 36th Annual Sessions of the SLAAS on 17th December 1980.

4. Loganathan, P., Mathes, D. T. and Balakrishnamurti, T. S. (1980). A fertilizer experiment with coconut on a lateritic gravelly soil with widely varying depths. Paper presented at the 36th Annual Sessions of the SLAAS on 16th December 1980.

5. Anthonypillai, G. M. and Loganathan, P. (1980). Extractable micronutrients in some sandy soils of Sri Lanka and their availability to coconut. Paper presented at the 30th Annual Sessions of the SLAAS on 16th December 1980.

P. LOGANATHAN
Head

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REPORT OF THE DIVISION OF ADVISORY AND EXTENSION SERVICES AND DOCUMENTATION 1980

With effect from 01–05–1980 the name of the Publications/Publicity Unit and Library was changed to "the Division of Advisory and Extension Services and Documentation."

This year too the Library and the Coconut Information Centre, set up in the library as a project of the IDRC, Canada, functioned together.

1. Publications

1.1 The following Coconut Research Institute publications were published during the year.

1.1.1	**Ceylon Coconut Quarterly**	Vol XXVII and XXVIII	Nos 3/4
		Vol XXIX	Nos 1–4
		Vol XXX	Nos 1/2

1.1.2 **Advisory Leaflets**

The following leaflets were revised wherever necessary and reprinted.

In Sinhala — No. 4, 8, 9, 33, 35, 36, 39, 40, 41 and 43

In English – No. 36

1.2 During the year the Coconut Information Centre issued the following publications.

1.2.1 **Coconis Newsletter** – Two issues in March and December

1.2.2 **Directory of Coconut Research Workers and Research Projects in the World**

1.2.3 **Thesaurus on Coconuts** (Draft copy)

1.2.4 **Alert Service** : the first instalment consisting of references to literature on coconut published during 1979.

2. Inquiries

Apart from the inquiries answered for the Institute Staff, five inquiries received from local bodies and eight from foreign countries were answered. Where necessary, the inquirers received relevant literature researches and photo copies. They were also introduced to relevant organisations and persons in order to pursue their inquiries further.

3. Contacts

In order to build up the Coconut Information Centre's literature collection, links were established with Computer Data Bases such as the AGRIS, CAB, IFIS and AGRIASTA. Links were also built up with such regional organizations as the APCC and ESCAP and national organizations such as the UCAP. Individual contacts were also established with individual researchers and Research Centres throughout the world.

4. Acquisitions and Inter Library Loans

Seventy-five new books were added bringing the total number of books to 3930. The total number of journals acquired on subscription and on exchange increased from 251 to 265. Several photo copies and reprints relating to literature on coconut from various countries were acquired.

The Library continued to give and receive materials on inter-library loan. Where possible photo copies of articles requested were also supplied.

5. Training Programmes

During the year 128 persons participated in the Training Programmes conducted by the Institute. The main Training Programmes were as follows.

5.1 Training Programme for 36 Coconut Development Officers (03.03.80 - 13.03.80).

5.2 Training Programme for five members of the executive staff of the regional warehouse complex of the Ceylon Fertilizer Corporation (07.08.80 - 08.08.80).

5.3 Training Programme for seventy field Officers of the Coconut Cultivation Board (09.06.80 - 20.06.80).

5.4 Training Programme for a visitor from the Department of forestry in Australia (05.09.80 - 12.09.80).

5.5 Training Programme for 14 newly recruited Technical Assistants of the Coconut Research Institute (12.11.80 - 18.11.80).

5.6 Training Programme for two students from the Hardy Agricultural Institute (03.11.80 - 31.12.80).

6. Visitors

During the year the Institute received 4054 local students from 54 schools and other educational institutions and 117 foreign visitors.

7. Film shows on Coconut

During the year 22 film shows were given according to requests from schools, societies, temples and churches.

8. Exhibitions on Coconut

The Institute participated in exhibitions on coconut by supplying models, specimens and other exhibits mainly to the Coconut Cultivation Board. However, during the tail end of the year, i.e., from 11.12.80 to 31.12.80 this Institute participated fully in the coconut exhibition installed in the premises of St. Xavier's College, Marawila as part of the Jubilee Nights carnival and exhibition. A feed-back survey was carried out to study the impact of the Marawila coconut exhibition on the visitors.

9. Personnel

Mr. M. S. S. Fernandopulle, the Publications/Publicity Officer, continued to offer his services as a Visiting Lecturer in the Department of Mass Communication at the University of Kelaniya. This year Mr. Fernandopulle was also made a member of the International Association for Mass Communication Research (IAMCR) based in Paris.

Mr. M. J. C. Perera, the Librarian and Project Leader, Coconut Information Centre, participated in the meetings of Librarians of Scientific and Technical Institutions held at the National Science Council and also offered his services as coordinator of the Agricultural Information Network. Mr. Perera also attended the 6th JAALD World Congress 3–7 March 1980 held in Manila as the Project Leader of the Coconut Information Centre. This year Mr. Perera passed the examination of the Library Association of London (Final, and Part II) and secured the Associateship in the Library Association (London).

Mr. K. G. G. Wijeweera, Library Assistant, attended the training Programme of Information Storage Retrieval Systems held at the SIET Institute in Hyderabad from 06.10.1980 to 12.12.1981. Mrs. H. R. N. Perera passed the Intermediate examination of the Sri Lanka Library Association.

The new recruits, Mr. P. A. H. N. Appuhamy, B.Sc. Agric. (Cey.), the Assistant Publications/Publicity Officer, Miss. R. Sathasivam, the Tamil Proofreader cum clerk Typist and Miss. L. C. Nanayakkara, the Library Assistant, assumed duties on 01.09.1980, 01.11.1980 and 01.12.1980 respectively. Miss. R. Sathasivam resigned from the services of the Institute with effect from 31.12.1980.

M. S. S. FERNANDOPULLE
Publications/Publicity Officer

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REPORT OF THE ADMINISTRATION DIVISION 1980

CADRE

The Staff of the Coconut Research Board at the end of Decmeber 1980 was as follows.

Grade	*Special Class*	*Class I*	*Class II*	*Class III*	*Class IV*	*Total*
Executive	1	4	6	23	6	40
Technical and Supervisory	6	10	43	—	—	59
Intermediate	—	3	2	—	—	05
Clerical and Allied	2	14	35	—	—	51
Operative	2	14	56	—	—	72
Minor	30	90	138	—	—	258
Board Staff	41	135	280	23	6	485

PROMOTIONS DURING THE YEAR

INTERNAL

The following internal promotions were made during the year.

1. Executive Grade

Mr. A. Jayatilleke, Research Assistant (Botany), as Officer-in-Charge, Genetics and Plant Breeding with effect from 15.09.1980.

Mrs. C. W. Ekanayake, Research Assistant (Botany), as Officer-in-Charge, Plant Biology with effect from 15.09.1980.

Dr. S. Mohanadas as Officer-in-Charge, Processing Research with effect from 15.09.1980.

Dr. B. H. Rohitha, Research Assistant, Crop Protection Division as Research Officer, Crop Protection Division with retrospective effect from 02.11.1978.

Dr. M. P. L. D. Martin, Research Assistant, Division of Intercropping as Research Officer, Division of Intercropping with retrospective effect from 09.11.1979.

Mr. M. B. S. Kurera, Accounting Assistant, Technical and Supervisory Grade (Special Class) to Executive Grade - Class IV as Staff Assistant (Accounts) effect from 04.07.1980.

Mr. M. A. Somadasa, Store-keeper, Clerical and Allied Grade (Special Class) to Executive Grade - Class IV as Supplies Officer wtih effect from 30.10.1980.

2. Technical and supervisory Grade (Special Class)

Mr. J. E. A. Dalpathado, Clerk, Clerical and Allied Grade (Special Class) to Technical and Supervisory Grade (Special Class) with retrospective effect from 01.01.1978.

3. Technical and Supervisory Grade Class II
Nil.

4. Intermediate Grade - Class I

From Intermediate Grade - Class II to Intermediate Grade - Class I. Mrs. N. G. Wijeratne, Stenographer (English), with effect from 29.08.1980.

5. Clerical and Allied Grade

From Minor Grade - Class I to Clerical and Allied Grade - Class II
Mr. W. P. Ranjan Fernando, Office Attendant (Accounts Section) as Clerk/Typist with effect from 07.04.1980.

Mr. H. H. J. Eddison Appuhamy, Estate Attendant as Estate Clerk with effect from 07.04.1980.

Mr. R. A. L. C. Fernando, Lab/Field Attendant (Publications/Publicity) as Clerk Typist with effect from 07.04.1980.

Mr. Y. H. Wijesena, Office Attendant (Intercropping Division) as Clerk/Typist with effect from 03.04.1980.

6. Operative Grade

From Minor Staff to Operative Grade - Class II

Mr. Y. H. N. Jayatissa as Lab/Field Assistant (Plant Breeding) with effect from 01.12.1980.

Mr. W. T. H. C. Fernando as Lab/Field Assistant (Plant Breeding) with effect from 01.12.1980.

Messrs A. T. Fernando, B. A. L. Mendis and J. B. Fernando (Field Attendants, Planting Division) as Field Assistants, (Planting Division) with effect from 10.12.1980.

Mr. K. Murugaiah, Field Attendant, Division of Soils as Field Assistant (Division of Soils) with effect from 01.12.1980.

The following internal promotions were made on 25.11.1980 with restrospective effect from 01.01.1979.

Mr. R. H. Bennet Silva, Clerk/Typist - Grade I to Clerical and Allied Grade (Special Class) as Head Clerk (Accounts Division).

Mr. P. Daluwatta, Clerk/Typist, Clerical and Allied, Grade Class II, to Class I.

Mr. B. A. L. Mendis, Field Attendant, Minor Grade - Class I, to Minor Grade (Special Class).

Mr. H. P. H. Dharmadasa, Field Attendant, Minor Grade - Class I, to Minor Grade, Special Class.

Mr. K. Murugaiah, Field Attendant, Minor Grade Class I, to Minor Grade, Special Class.

Mr. Y. H. N. Jayatissa, Minor Grade Class I, to Minor Grade, Special Class.

Mr. N. Nadarajah, Minor Grade, Class I, to Minor Grade Special Class.

Mr. A. D. Yasaratne, Minor Grade, Class I, to Minor Grade, Special Class.

Mr. P. A. D. P. R. Caldera, Minor Grade, Class I, to Minor Grade, Special Class.

Mr. W. M. Francis Fernando, Driver, Class I, to Special Class.

Mr. S. A. Francis Appuhamy, Driver, Class I, to Special Class.

Mr. W. E. R. C. Fernando, Lab/Field Attendant, Minor Grade, Class I, to Special Class.

EXTERNAL APPOINTMENTS

The following external appointments were made during the year.

Mr. A. Jayatilleke was appointed to Executive Grade III as Research Assistant with effect from 02.01.1980.

Messrs M. A. Tilakasiri and T. S. G. Peiris were appointed to Executive Grade Class III as Research Assistants with effect from 01.09.1980.

Mr. K. R. R. A. Peiris was appointed to Executive Grade, Class III as Research Assistant (Temporary) with effect from 17.11.1980.

Mr. P. A. H. N. Appuhamy was appointed to Executive Grade, Class IV as Assistant Publications/Publicity Officer with effect from 01.09.1980.

Mr. D. B. Jayasinghe was appointed as Documentation Assistant with effect from 10.03.1980.

Mr. R. Marasinghe was appointed to Technical and Supervisory Grade, Class II as Technical Assistant with effect from 01.09.1980.

The following appointments were made to Technical and Supervisory Grade, Class II as Technical Assistants with effect from 15.10.1980.

Mr. H. F. G. Perera,
Mr. W. C. K. Fernando,
Miss I. Elvitigala,
Miss G. N. G. Perera,
Miss D. M. D. I. Wijebandara,
Mrs. W. A. N. G. Samudra,
Mr. W. Warnasiri,
Mr. K. A. S. Chandrasiri,
Mr. D. N. G. K. Gamage,
Mr. H. P. P. H. Pathirana,
Mr. M. H. L. Padmasiri,
Mr. H. A. Abeysoma,
Mr. A. M. J. Wijeratne,
Miss. C. K. A. Gamage and
Miss. W. B. S. Fernando

Messrs N. P. Gunaratna, and W. P. B. A. S. Fernando were appointed to Technical and Supervisory Grade, Class II as Technical Assistants with effect from 16.10.1980.

Mr. M. B. Raymond Fernando was appointed as Clerk/Typist with effect from 03.04.1980.

Mrs. N. R. Marasinghe was appointed as Clerk (Planting Division) with effect from 02.05.1980.

Miss D. M. Therese Perera was appointed as Clerk/Typist with effect from 08.04.1980.

Mrs. C. Munasinghe was appointed as Clerk (Accounts) with effect from 11.08.1980.

Miss R. Sathasivam was appointed as Tamil Proofreader cum Clerk/Typist with effect from 10.11.1980.

Miss L. C. Nanayakkara was appointed as Library Assistant with effect from 01.12.1980.

Messrs W. N. K. Herath and A. Jayatilleke were appointed as Lab/Field Assistants (Biometry and Agronomy respectively) with effect from first and eight December 1980 respectively.

Retirement, Resignations and Deaths

Deaths

Dr. A. S. Amarasinghe, Research Assistant, Division of Soils died under tragic circumstances on 26.09.1980.

Retirements

Mr. H. W. Fernando, Field Assistant, Operative Grade (Special Class) with effect from 06.05.1980.
Mr. A. B. A. Jayamaha, Senior Field Assistant, Soil Chemistry Division, Operative Grade (Special Class) with effect from 05.05.1980.
Mr. G. Rajapakse, Senior Field Assistant, Soil Chemistry Division, Operative Grade (Special Class) with effect from 15.04.1980.

Mr. V. Abeywardena, Biometrician who was on a contract for a period of one year as Biometrician retired with effect from 18.12.1980.

Mr. M. P. Tissera, Technical Assistant, Division of Chemistry, with effect from 22.07.1980.

Resignations

Miss Surangani Dharmwardena, Research Assistant, Division of Botany, resigned from the services with effect from 13.07.1980.

Mr. A. Jayatilleke, Research Assistant, Division of Botany, resigned from the services with effect from 03.11.1980.

Mr. K. P. D. G. Karunayake, Technical Assistant (Biometry), resigned from the services with effect from 16.07.1980.

Mr. D. P. Panditharatne, Technical Assistant, Division of Soil Chemistry, resigned from the services with effect from 01.03.1980.

Mr. V. L. K. Ratnaweera, Technical Assistant, Division of Soils, resigned from the services with effect from 21.01.80.

Miss R. Sathasivam, Tamil Proofreader cum Clerk/Typist, resigned from the services with effect from 31.12.1980.

Mr. H. K. Amaradasa, Lab/Field Assistant, resigned from the services with effect from 09.12.1980.

Dr. M. P. L. D. Martin, Research Officer, Division of Agronomy, resigned from the services with effect from 31.12.1980.

WELFARE

(a) M. P. C. S.

The C. R. I. Multi-purpose Co-operative Society catered to the needs of the Staff in the supply of essential articles including foodstuffs and materials. The Society has still further expanded its activities. The Board continued to give its annual grant of Rs. 1500/-.

(b) Financial Aid

The following amounts were given out as loans during the year.

(i) Provident Fund — A sum of Rs. 874,991.00 as provident fund loans and Rs. 15,825.04 as provident fund insurance premia.

(ii) Distress loans — A sum of Rs. 3,80,168.85 as distress loans.

(iii) Transport — A sum of Rs. 82,052.31 as transport loans was paid during the year.

(c) Medical Aid

The contributory Medical Aid Scheme continued to be in force for the benifit of a few members. A sum of Rs. 728.80 has been paid on medical aid claims. Credit facilities from the private doctors continued with the grant of the usual discount allowed to members.

B. E. PEIRIS
Deputy Director (Adm. and Finance)

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REPORT ON ESTATES – 1980

(1) BANDIRIPPUWA ESTATE, LUNUWILA

(1) Area statement

Classification		Area			
		Hectares	(*A*	*R*	*P*)
Bandirippuwa Estate (1)	A	61.92	(153	0	00)
Bandirippuwa Estate (2)	B	47.84	(118	0	38)
Bandirippuwa Estate (2)	B	24.25	(59	3	26)
Bandirippuwa Estate (2)	C	14.08	(34	3	07)
Total		148.09	(365	3	31)
Research		58.68	(145	0	00)
Estate		82.19	(203	0	17)
Buildings etc.		6.88	(17	0	00)
Paddy etc.		0.34	(0	3	14)
Total		148.09	(365	3	31)

(2) Distribution of area by blocks

Blocks	*Research*				*Estate*				*Total*			
	Hectares	(*A*	*R*	*P*)	*Hectares*	(*A*	*R*	*P*)	*Hectares*	(*A*	*R*	*P*)
B/E(1) 1	1.21	(3	0	00)	10.52	(26	0	00)	11.74	(29	0	00)
„ 2	—	(0	0	00)	5.67	(14	0	00)	5.67	(14	0	00)
„ 3	4.86	(12	0	00)	4.45	(11	0	00)	9.31	(23	0	00)
„ 4	2.02	(5	0	00)	15.02	(37	0	17)	17.03	(42	0	17)
„ 5	3.64	(9	0	00)	5.26	(13	0	00)	8.90	(22	0	00)
„ 6	2.43	(6	0	00)	2.02	(5	0	00)	4.45	(11	0	00)
B/E (2)A	26.71	(66	0	00)	20.23	(50	0	00)	46.94	(116	0	00)
B	10.52	(26	0	00)	12.55	(31	0	00)	23.07	(57	0	00)
C	7.28	(18	0	00)	6.47	(16	0	00)	13.76	(34	0	00)
Total	58.68	(145	0	00)	82.19	(203	0	17)	140.87	(348	0	17)
Buildings	—	—	—	—	6.88	(17	0	00)	6.68	(17	0	00)
Paddy	—	—	—	—	0.34	(0	3	14)	0.34	(0	3	14)
Grand Total	58.68	(145	0	00)	89.41	(220	3	31)	148.09	(365	3	31)

(3) Census of palms (end 1979) classified under different blocks

Block/Classification	1	2	3	4	5	6	*A*	*B*	*C*	*Total*
Bearing	1534	599	1162	1691	977	613	4518	2645	1878	15617
Tapping	—	—	—	24	24	—	—	—	—	48
Duds	36	18	10	125	10	15	30	57	57	358
In flower	—	—	06	—	—	02	310	50	—	368
Established	06	—	06	01	—	01	464	90	—	568
Seedlings	—	—	—	20	—	—	1436	102	—	1558
Vacancies	203	116	161	588	323	119	1292	636	316	3754
Total	1779	733	1345	2449	1334	750	8050	3580	2251	22271

(4) Crops

Total crops from 1976 – to 1980 with the respective averages

Crops	1976	1977	1978	1979	1980	*Total*	*5 year Average*
1st	70,288	50,943	84,015	99,957	83,066	388,269	77,654
2nd	172,179	108,876	91,549	150,166	87,271	610,041	122,008
3rd	167,115	115,968	128,339	149,830	117,550	678,802	135,761
4th	150,254	118,944	84,601	105,428	105,820	565,047	113,009
5th	85,741	90,024	81,320	54,710	51,977	363,772	72,755
6th	51,560	59,365	84,082	74,902	43,458	313,367	62,673
Total	697,137	544,120	553,906	634,993	489,142	2,919,298	583,860

(5) Disposal of crops in 1980

Mode of disposal	*No of nuts*	
Sold to contractors	367,315	
Converted into copra	51,465	
Nut allowance	38,374	
Sold to seednuts	6,770	
Sold to research	4,771	
Sold to C. R. B. canteen	1,480	
Sold to others	230	
Sold to C. C. B. staff	150	
Sold to C. R. B. staff	50	
Empties	18,537	3.78% (empties)
Total	489,142	

(7) Work done in the estate during the year 1980

a. *Weeding* :- Weeding has been done in 10,906 squares of the estate.

b. *Fences* :- All fences were maintained in good condition. A new fence was constructed with concrete posts with six strands of barbed wire.

c. *Drains* :- All existing drains were maintained in good condition.

d. *Manuring* :- The estate palms were manured with CU 1 mixture 3 kg/palm. A total amount of 25412 kg of manure was used in 1980.

e *Uprooting* :- 1174 palms (duds and old palms) were uprooted for the purpose of replanting in blocks, 2, 5, 6 and block A.

f. *Replanting* :- 10 acres (4.0468 hectares) in block 2
4 „ (1.6194 „) in block 6

Underplanting:- 18 acres (7.2874 hectares) in block A

g. *Other Operations* :- Roads were maintained in good condition. Necessary action was taken to eradicate all types of pest and diseases in the estate section.

h. *General:* - Steps were taken during the latter part of 1980 to strengthen the security measures of the estate.
As a result a new watch hut was established near the main gate of the estate.

(8) Personnel :- The breakdown of the staff and the labour force as at 1980.12.31 is given below.

Superintendent		R. M. de Silva
Field Assistant Estate		E. M. Gunarath Banda
Clerk / Estate		H. H. J. Edison Appuhamy
Field Attendant/Estate		W. W. R. Fernando
Kangani / Estate		A. K. Amarasiripala
Watchers	Permanent	— 8
	Temporary	— 6
Labourers	Permanent	— 48
	Temporary	— 31

A. G. KINGSLEY SILVA
Officer-in-Charge

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(2) RATMALAGARA ESTATE, MADAMPE — 1980

Area statement

Area	*Hectares*	*A*	*R*	*P*
Research Section	29.14	(72	0	0)
Estate Section	66.37	(164	0	0)
Nurseries	5.26	(13	0	0)
Roads and Buildings	2.02	(5	0	0)
Jungle and Wasteland	7.69	(19	0	0)
Total	110.48	(273	0	0)

Distribution of area by sections

	Hectares	*A*	*R*	*P*
Botany Division	12.95	(32	0	0)
Division of Soil Science	10.12	(25	0	0)
Division of Agronomy	11.13	(27	2	0)
Division of Biometry and Agricultural Economics	1.01	(2	2	0)
Planting Division	5.26	(13	0	0)
Estate Section	70.01	(173	0	0)
Total ..	110.48	(273	0	0)

Census of palms

Particulars	*Fields*								*Botany*	
	1	2	3	4	5	6	7	8	*Block*	*Total*
Bearing palms ..	1,468	196	751	1,472	1,110	1,616	2,883	469	1,857	11,822
Young palms ..	11	—	—	7	—	—	9	—	417	444
Dud palms ..	104	22	15	—	25	23	—	1	—	196
Vacancies ..	28	22	58	44	36	50	58	23	870*	1189
Total ..	1,611	240	824	1,523	1,171	1,689	2,950	493	3,144	13,651

* Vacancies in the hedge plantation will not be supplied.

Comparative rainfall 1979/1980 with wet days

Month	1979 mm	1979 Wet days	1980 mm	1980 Wet days	5 year rainfall (1974-78) Total mm	5 year rainfall (1974-78) Average mm
January ..	0	0	0	0	10.09	2.02
February ..	167.3	7	—	—	200.54	40.11
March ..	16.9	3	16.7	3	579.39	115.09
April ..	70.6	8	208.2	13	1,376.69	275.03
May ..	46.9	6	74.0	8	1,804.53	360.09
June ..	46.1	13	246.1	12	515.36	103.01
July ..	28.8	4	14.3	5	402.88	80.06
August ..	46.1	7	31.2	7	226.36	45.03
September ..	125.6	18	149.0	9	438.85	87.08
October ..	316.3	16	239.6	14	1,630.70	326.14
November ..	377.3	27	273.2	17	1,918.02	383.06
December ..	272.6	11	126.4	13	634.07	126.08
Total	1,514.5	120	1,252.3	101	9,738.47	1,947.75

Total crops from 1975 to 1980

Pick No	1975	1976	1977	1978	1979	1980
1 ..	133,532	55,240	81,584	102,898	70,522	54,144
2 ..	150,920	109,755	136,050	119,322	88,362	78,827
3 ..	160,380	142,305	138,365	128,867	160,199	93,213
4 ..	174,531	163,944	171,919	150,027	143,041	84,513
5 ..	142,026	147,414	149,312	98,838	86,422	66,913
6 ..	68,631	78,444	75,885	86,177	56,902	64,232
Total	830,020	697,102	753,115	686,129	605,448	441,842

Crop disposal for 1980

Nuts cured into copra		126,017
Nuts sold on contract		259,597
Nuts issued for research ..		9,398
Nuts issued as seednuts ..		17,680
Nuts issued to staff		13,396
Empties and rejections ..		15,581
Nuts missing		173
		441,842

Copra

The 126,017 nuts converted to copra resulted as follows:

No. 1 copra	11,046 kg	350 g being	83.1%
No. 2 copra	1,949 kg	400 g being	14.7%
No. 3 copra	291 kg	960 g being	2.2%
Total	13,286 kg	1710 g	

The copra out-turn was 2,383 inclusive of Botanist's dwarf palm nuts and buyers' rejections. The percentage of empties and rejections was 3.5.

Field notes

Research divisions namely, Botany and Plant Breeding, Soil Science, Agronomy and Biometry and Agricultural Economics continued to conduct field experiments at Ratmalagara Estate. Other than the Division of Biometry and Agricultural Economics respective resident officers are in charge of the research programmes of the Divisions.

A cattle herd was maintained by the Division of Agronomy. The herd strength as at 31st December 1980 was as follows.

Cows	38
Heifers	6
Calves	3
	47

General

Manuring :

All the estate palms were manured with 3 kilogrammes of C.U.I. mixture per palm. All the palms were clean weeded 6 feet round the palm before the application of fertilizer. The fertilizer was broadcast round the clean weeded palm and incorporated into the soil by digging in with mammoties. After manuring, the palms were mulched with fallen fronds.

Husk Burying :

In block No 5 husk burying was done completely. In block No. 8 all the contour drains became extrasized due to continued deepening and clearing. Husks were laid out to build up contour husk bunds on the advice of the Visiting Agent.

Very old husks that were lying in heaps for several years were dumped into pits after consulting the Visiting Agent.

The entire estate was well weeded by way of manual labour and harrowing. All the estate roads, drains, and bunds too were maintained satisfactorily. The estate boundary fences were kept in good repair.

There was no outbreak of any pest or disease. But there were a few palms with the symptoms of scorch in the hedge plantation and these have been under observation.

All the estate buildings were maintained well and the resident staff were provided with uninterrupted supply of water and electricity. The supply of the main current 230V/AC/to Ratmalagara Estate has been in progress.

Staff

Much is to be desired with regard to the provision of field and clerical staff to this estate. Due to unsatisfactory staffing the entire clerical work was interrupted and had to be attended to with difficulty with borrowed clerical assistance. Estate management was done with the help of one field attendant.

M. R. S. FERNANDO
Officer-in-Charge

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A DRAFT INCOME AND EXPENDITURE STATEMENT – 1980

		Income Rs.	*Expenditure* Rs.
1.	Administration Division	424,100	6,632,800
2.	Chemistry Division	1,500	569,600
3.	Botany and Plant Breeding Division ..	4,800	694,000
4.	Soil Science Division	—	1,238,400
5.	Agronomy Division	230,500	737,800
6.	Crop Protection Division	—	443,400
7.	Biometry and Agricultural Economics Division	—	182,900
8.	Planting Division	126,900	6,855,800
9.	Estates	1,516,900	1,075,600
10.	Coconut Information Centre ..	—	636,200
	Total	2,304,700	19,066,500

G. W. M. WIJETUNGA
Accountant