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Annual Report of the Coconut Research Scheme for 1946

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COCONUT RESEARCH SCHEME.

ANNUAL REPORT OF THE BOARD OF MANAGEMENT FOR THE YEAR 1946.

(In terms of Section 8 (2) of the Cocount Research Ordinance (Cap. 303)).

BOARD OF MANAGEMENT.

On January 1, 1946, the Board of Management consisted of the following members:—

Chairman: The Director of Agriculture (Mr. L. J. de S. Seneviratne, C.C.S.).
Deputy Financial Secretary: (Col. C. J. Dane Lanktree, O.B.E., E.D., C.C.S.).

The Chairman of the Low-Country Products Association of Ceylon (Mr. S. F. H. Perera).

Members of the State Council nominated by His Excellency the Governor.	Mr. Dudley S. Senanayake, B.A. Vacant
Representatives of the Low-Country Products Association.	Mr. Vernon Rajapakse. Mr. Stanley Dias.
Representatives of the Planters' Association of Ceylon.	Mr. W. P. H. Dias, J.P. Mr. A. Pearson.
Representing the Small-Holders, nominated by His Excellency the Governor.	Mr. Graham Pandittesekera, J.P., U.M. Mr. C. A. M. de Silva.

Mr. E. Muttukumaru was nominated by the Planters' Association as one of its representatives in place of Mr. W. P. H. Dias, on the completion of the latter's term of office on February 9.

Mr. J. Tyagaraja, M.S.C. for Mannar, was nominated by His Excellency the Governor as one of the State Council members, with effect from March 12. Mr. Tyagarajah had previously been an *ex-officio* member of the Board as Chairman of the Low-Country Products Association in 1937, 1938 and 1939.

Mr. C. A. M. de Silva was elected Chairman of the Low-Country Products Association from March 30, and so became an *ex-officio* member in place of Mr. S. F. H. Perera.

This left a vacancy among the Smallholders' representatives which was filled by the nomination of Mr. D. D. Karunaratne, J.P., who had previously served on the Board in the same capacity from 1935-1944.

Mr. H. E. Peries, C.C.S., was deputed by the Acting Financial Secretary to be an *ex-officio* member of the Board from April 26, succeeding Col. C. J. Dane Lanktree.

Mr. T. Amarasuriya, M.S.C., was nominated by His Excellency the Governor as one of the State Council members, with effect from May 17, in place of Mr. Dudley S. Senanayake, on the expiry of the latter's term of office.

Mr. A. Pearson, representative of the Planters' Association of Ceylon on the Board, left the Island on 6 months furlough on December 17, and the vacancy was not filled at the end of the year.

Five meetings of the Board were held during the year on February 22, May 27, July 4, September 30, and November 4, 1946.

COMMITTEES.

Buildings Sub-Committee.—Personnel at January 1, 1946: Mr. Graham Pandittesekera, J.P., U.M. (Chairman), Mr. W. P. H. Dias, J.P., Mr. A. Pearson.

At the 79th meeting of the Board of Management held on February 22, Mr. E. Muttukumaru was elected to fill the vacancy on the Committee, consequent on the retirement of Mr. W. P. H. Dias.

One Meeting, on March 9, was held by the Committee during the year.

Sub-Committee for Staff Matters.—Personnel at January 1, 1946: The Deputy Financial Secretary, Mr. C. A. M. de Silva, Mr. Vernon Rajapakse, Director of Research (Convenor).

At the 81st meeting of the Board held on July 4, Mr. G. Pandittesekera was elected to take the place of the Deputy Financial Secretary in the Committee.

One meeting, on August 21, was held by the Committee during the year.

Estates' Sub-Committee.—Personnel at January 1, 1946: Mr. S. F. H. Perera, Mr. A. Pearson, Mr. C. A. M. de Silva, Mr. B. Parker (Visiting Agent) Director of Research, Geneticist, Soil Chemist and Secretary-Accountant (Convenor).

At the 80th meeting of the Board of Management, held on May 27, Mr. E. Muttukumaru was elected to fill the vacancy on the Committee, consequent on the retirement of Mr. S. F. H. Perera. One meeting was held on August 30, 1946.

2. Staff.—

Director of Research and Technological Chemist: Dr. R. Child, B.Sc., Ph.D. (Lond.), F.R.I.C. (on leave).

Geneticist and Acting Director of Research: Mr. W. V. D. Peiris, M.A. (Cantab.), B.Sc. (Lond.), Dip. Agric. (Cantab.).

Soil Chemist: Dr. M. L. M. Salgado, B.Sc. (Lond.), Ph.D. (Cantab.), Dip. Agric. (Cantab.).

Secretary-Accountant: Mr. S. C. Kahawita, B.Com. (Lond.).

Research Assistant to Technological Chemist: Mr. W. R. N. Nathanael, B.Sc. (Lond.).

Mechanic: Mr. R. Weerapermal.

Dr. R. Child returned to the Island on January 10, and assumed duties as Director on January 15.

Mr. W. V. D. Pieris, Geneticist since 1930 and the member of the staff with the longest service, resigned his post on June 1 and left the Island in September. The post had not been filled by the end of the year; the work of the Division being carried on by Mr. D. V. Liyanage, Technical Assistant.

Mr. P. J. Nonis, Estate Superintendent since the acquisition of Bandirippuwa Estate in 1931, resigned his post and left at the end of July to take up the post of Superintendent, Ratmalana Estate, Mount Lavinia.

Mr. W. Nanayakkara, Conductor, Bandirippuwa Estate, left the service of the Scheme at the end of October.

Mr. C. S. A. Fernando, Junior Clerk, left at the end of May.

The following new appointments were made during 1946:

Mr. K. A. Salaam was appointed as Secretary to the Chairman of the Boards of the Rubber and Coconut Research Schemes from February 1. He is stationed at the Head Office of the Department of Agriculture, Peradeniya.

Mr. L. A. Fernando was appointed Technical Assistant to the Soil Chemist from April 1.

Mr. W. K. D. Rasiah, temporary Book-keeper, was confirmed in the post of Book-keeper-Clerk, with effect from July 1.

Mr. O. D. J. Wanasinghe was appointed Clerk-Stenographer from September 1, and Mr. F. H. B. Felix Silva, temporary Clerk, was confirmed in the post of Junior Clerk from the same date.

Mr. E. Basnayake was appointed Superintendent, Ratmalagara Estate, from September 14, and Mr. W. D. Frederick as Superintendent, Bandirippuwa Estate, from October 14.

At the Annual General Meeting of the Ceylon Association of Science held on September 21, 1946, Dr. R. Child, Director, was elected President of Section E (Physical Sciences) for the Third Annual Sessions, 1946-47.

3. Legislation, &c.—

(i.) The Coconut Research (Amendment) Ordinance, No. 62 of 1946, received the Governor's assent on December 11. It is: "An Ordinance to amend the

Account Research Ordinance so as to authorise retrospectively the establishment of a Provident Fund for the benefit of employees of the Coconut Research Scheme, and to validate acts done and rules made heretofore in connection with the establishment and maintenance of such fund."

(ii) *Future of the Scheme.*—The Supplement to the Memorandum of the Board of Management on the Future of the Coconut Research Scheme was printed and circulated during the year, and with the original Memorandum was referred to Government for consideration.

4. Summarised Departmental Reports.—

A. Technological Chemist's Department.—

(i) *Sugars in Coconut Water.*—(a) In amplification of work reported last year, ketoses were determined on samples of nut water by a modification of the Kolthoff—Kruisheer method (Cf. Brown and Zerban, "Sugar Analysis", 3rd Edition 1941, p. 902). Hypoiodite oxidation of aldoses was carried out as in the original method, and residual ketoses estimated by Lane and Eynon's method. This procedure was found satisfactory when checked against inverted sucrose solutions, and after some preliminary experiments, was applied to samples taken from nuts at all stages of ripeness on a single palm. A summary of the results is given in the following table:—

No. of bunch.	No. of nuts on bunch.	Volume of water per nut c.c.	Total solids gms/100 c.c.	Ketoses as fructose. gms/100 c.c.	Glucose by difference gms/100 c.c.	Sucrose gms/100 c.c.	Total Sugars gms/100 c.c.	Total sugars as % of total solids.
*I	6	13	3.22	0.53	0.62	0	1.15	35.7
II	6	64	3.45	0.81	0.93	0	1.74	50.4
III	5	142	3.51	1.08	1.28	0	2.36	67.2
IV	4	295	3.96	1.25	1.59	0	2.84	71.7
V	11	375	4.28	1.51	1.68	0	3.19	74.5
VI	12	448	4.51	1.72	1.93	0.05	3.70	82.0
VII	10	414	5.24	2.15	2.14	0.14	4.43	84.5
VIII	8	360	5.74	2.20	2.42	0.25	4.87	84.8
IX	9	299	6.23†	—	4.38	0.62	5.00	80.3
X	9	234	6.15†	—	3.58	0.89	4.47	72.7
XI	14	229	5.59†	—	2.76	0.84	3.60	64.4
XII	4	235	5.34†	—	1.17	1.53	2.70	50.6
XIII	10	229	5.34	0.76	1.16	1.03	2.95	47.8
XIV	4	285	5.47	0.77	1.11	1.08	2.96	54.1
XV	7	193	5.37	0.45	0.40	1.36	2.21	41.2
XVI	7	163	5.50	0.36	0.28	1.62	2.26	41.1

* There were three more immature bunches. (i) 4 nuts, average water content 1.2 c.c., (ii) 7 "buttons" with no cavity, (iii) 27 female flowers (just opened spathe.)

† Only total reducing sugars determined.

These results confirm the probability that the sugars of coconut water consist essentially of sucrose and invert sugar.

(b) *Mannitol.*—A reference over 100 years old ascribed to Bizio an analysis of coconut water, which was stated to contain 3.8 per cent. of mannitol. Dunstan (*Tropical Agriculturist, Ceylon*, 1906, 26, 377-378) found 1.8 per cent. of mannitol in a sample of coconut water sent from Ceylon to London in a sealed tin, and preserved—as it was thought—by the addition of chloroform. No observer has reported mannitol in fresh coconut water.

From stale coconut water, which contained no remaining fermentable sugar, mannitol, m.p. 164°C, was obtained without difficulty by evaporating to dryness and extracting the residue with 90 per cent. alcohol. The yield was about 2 gm. per litre. It seems likely that mannitol is formed in stale coconut water by bacterial reduction of sugars. At the same time, as the results tabulated above and those published in last year's report show, there is a good deal of organic matter in ripe coconut water other than sugars, and further investigation is desirable.

(ii.) *Composition of Coconut "Apples"*.—Nitrogen was determined on the extracts and extracted residues of the samples reported last year. The following table summarises the results:—

Size and approximate time in nursery.	Average weight of apple per gms.	Moisture per cent.	Alcohol extract.	Residue due per cent.	N of Extract		N of Residue		Total N. per cent. of original.
					As per cent.	As per cent. of extract.	As per cent. of original.	As per cent. of residue.	
Small 3½ months..	13·2 ..	82·2 ..	10·9 ..	7·4 ..	0·99 ..	0·11 ..	1·99 ..	0·15 ..	0·26
Medium 5 months	60·6 ..	85·3 ..	10·9 ..	4·7 ..	1·07 ..	0·12 ..	1·66 ..	0·08 ..	0·20
Large 6 months ..	144·8 ..	86·8 ..	9·6 ..	4·1 ..	0·90 ..	0·09 ..	1·50 ..	0·06 ..	0·15

A qualitative examination showed the residue to be largely composed of cellulose.

(iii) *Meat of Immature Nuts*.—Preliminary experiments were made on the soft pulp-like kernel of the immature nut at the drinking stage, known in Ceylon as Kurumbas. Four nuts from the same bunch were examined:—

No.	Volume of water.	Weight of wet kernel. gms.	% moisture of kernel.	% Fat	
				Wet.	Dry.
1	500 ..	142 ..	— ..	— ..
2	430 ..	125 ..	82 ..	5·3 ..
3	490 ..	128 ..	— ..	3·3 ..
4	465 ..	167 ..	82 ..	— ..

Acetone extraction of the wet pulp was not satisfactory; fat was extracted by mixing the pulp with 80 per cent. of its weight of anhydrous sodium sulphate; the mixture was well ground and extracted in a Soxhlet apparatus with ether.

The fat from sample 3 had Acid value 0.24, Saponification value 248.4 and Iodine value 17.0; and thus differs somewhat from the fat of the ripe nut in containing more unsaturated acids. A study of the amount and composition of the fat as the nut matures would be of considerable theoretical interest.

(iv) *Coconut Oil. (a) Density of Coconut Oil*.—Enquiries were received from shippers of coconut oil in connection with bulk shipment. It was required to be able to convert volumes to weights at temperatures encountered under tropical conditions. A series of accurate density measurements was carried out on typical samples of commercial coconut oil, from which the following table was constructed:—

Coconut Oil. Volume : Weight Conversion Table.

	Lbs/Gallons.	Gallons/Ton.	Tons/1,000 gallons.				°F	
			T	C	Q	L		
70°F	9·224 ..	242·8 ..	4	2	1	12 ..	70°
75°	9·205 ..	243·4 ..	4	2	0	21 ..	75°
80°	9·187 ..	243·8 ..	4	2	0	3 ..	80°
85°	9·168 ..	244·3 ..	4	1	3	12 ..	85°
90°	9·150 ..	244·8 ..	4	1	2	22 ..	90°
95°	9·132 ..	245·3 ..	4	1	2	4 ..	95°
100°	9·114 ..	245·8 ..	4	1	1	14 ..	100°
105°	9·096 ..	246·3 ..	4	1	0	24 ..	105°
110°	9·078 ..	246·75 ..	4	1	1	0 ..	110°

It should perhaps be mentioned here that coconut oil tends to solidify at temperatures around 70°F and that figures extrapolated from the above table for lower temperatures, at which the oil is partially or wholly solid, are unreliable. A method for obtaining sufficiently accurate figures in such cases is given by E. R. Bolton and K. A. Williams (*Analyst*, 1935, 60, 158-159.)

(b) *Sundry Analyses*.—Analytical reports were given on six samples of coconut oil referred to the Scheme from official sources. They presented in themselves no points of interest.

It may be as well to report here that the Scheme does not normally undertake routine analysis of samples which should be referred to a consulting analyst. Not infrequently enquirers consult the Technological Chemist about the potentialities of new processes and products they are trying to develop.

In suitable cases the Scheme is prepared to examine samples and to report whether they are satisfactory. It is obvious, however, that no opinion can be expressed on the possibilities of industrial processes, unless details are furnished. If the inventors are unwilling to trust the Scheme's staff with such information, their procedure should be to take out a provisional patent, after which full particulars could be given and a considered opinion obtained from the Scheme.

(v) *Sundry Coconut Products*.—(a) Analytical reports on three soap samples and advice concerning small scale manufacture were provided to one enquirer.

(b) A sample of poonac, manufactured by pressing copra in a rotary "ghani" of Indian type, contained moisture 11.0, oil 10.0, oil (dry weight) 11.2 per cent. This indicates that oil expression was quite good with this type of equipment, amounting to approximately 60 per cent. on good estate copra.

(c) A sample of desiccated coconut submitted had moisture 4.2, oil 58.6, oil (dry weight) 61.4 per cent., f. f. a. of oil, 0.09 per cent., (as lauric). Normal desiccated coconut contains 70 per cent. of oil (dry weight), so that over 10 per cent., of the oil had been extracted or expressed from this sample. Under tropical conditions, especially at temperatures over 100°F., desiccated coconut tends to "sweat" oil, causing oil-staining of packing cases. A product from which a proportion of the oil had been removed might have some application under such conditions. It is difficult to see any other purpose in removing oil from desiccated coconut, which is more highly priced than coconut oil.

(vi) *Coconut Shell Products*.—Work commenced in the previous year was continued on alkaline oxidation of shells and on the tar oils from dry distillation. It was still in progress at the end of the year and an account of results is deferred until next year's report.

(vii) *Miscellaneous (Products other than Coconut)*.—(a) A sample of commercial linseed oil was examined for the Tea Research Institute and reported as not up to B.S.S.—243/1926.

(b) Samples of Trimyristin (from Nutmeg butter) and Oleodistearin (from the fat of *Garcinia echinocarpa* Thwaites—see Annual Report for 1940, Sessional Paper XVI., 1941, page 5) were prepared for exhibition purposes.

(c) *Groundnuts*.—A random sample of locally purchased (Indian) groundnuts was examined with reference to the testa or seed-coat. This constituted 3 per cent., of the kernels, and contained 7.0 per cent. of oil of Sap. value 201.0, Iodine Value 70.5, Refractive Index (40°C) 1.4700. These seed coats are removed when groundnut kernels are crushed for oil.

B. Geneticist's Department.—

(i) *Bandirippuwa and Ratmalagara Estates*.—

(a) *Geneticist's Block "B"*.—The detailed recording on this block of 300 (296 bearing) palms, commenced in August, 1931, has been maintained. The average yield of nuts per palm in 1946 was 81.9. Fifty-five of the palms are kept as selected seed-bearers.

The sixteen years' yield figures indicate that the yield characters of palms remain relatively constant in the sense that palms which bore particularly well in 1931 generally continue to do so.

On a hundred of these palms records are kept of female flowers formed, in addition to the usual records of numbers of bunches and of nuts.

(b) *Mother Palms*.—Yield recording of the selected seed bearers in other parts of Bandirippuwa Estate was continued.

(c) *Latin Square Experiment: (Ratmalagara)*.—This field experiment, designed to compare the selected and unselected progeny of high yielding palms,

low yielding palms and seednuts taken at random, completed its seventh year. By the end of 1946, 394 out of a total of 576 palms had flowered, and 102 palms were in bearing. Details of the performance of the six classes are tabulated below:—

- A.—Selected seedlings derived from high-yielding palms.
- B.—Unselected seedlings derived from high yielding palms.
- C.—Selected seedlings derived from low-yielding palms.
- D.—Unselected seedlings derived from low-yielding palms.
- E.—Selected seedlings derived from nuts of estate heaps.
- F.—Unselected seedlings derived from nuts of estate heaps.

	Palms in flower.			Palms in bearing. No. of nuts picked.			Weight of nuts (lbs.)			
	5th.	6th.	7th year.	5th.	6th.	7th year.	6th.	7th year.	6th.	7th year.
A ..	7..	42..	71..	0..	2..	25..	29..	285..	36..75..	354..50
C ..	8..	43..	69..	0..	3..	21..	25..	278..	39..50..	375..25
E ..	9..	37..	66..	0..	3..	20..	14..	235..	17..00..	294..50
Total ..	24..	122..	206..	0..	8..	66..	68..	798..	93..24..	1,024..25
B ..	0..	19..	51..	0..	0..	10..	0..	55..	0..	66..25
D ..	5..	39..	71..	0..	0..	11..	0..	191..	0..	228..50
F ..	5..	35..	66..	0..	0..	15..	0..	133..	0..	153..25
Total ..	10	93	188..	0..	0..	36..	0..	379..	0	448..00

Pending statistical analysis of the detailed figures, it is only possible to say that the value of seedling selection is definitely indicated in earlier flowering and bearing.

Catch Crops: Pineapples.—Reference has been made in the two previous reports to the growing of pineapples in this 12-acre clearing. The crop in 1946 was less satisfactory than in 1945, but 11,524 lbs., were harvested (about 5 tons), and realised Rs. 655.99, or Rs. 54.88 per acre. As the palms are reaching the bearing stage, the pineapples will possibly be removed after 1947.

(d) *Dwarf Palm Block (Ratmalagara).*—Routine observations on the 992 dwarf palms (about 10 acres) were continued. A number of palms in this area are clearly hybrids, bearing nuts of larger size than true dwarfs and frequently being very prolific.

(ii) *Nurseries and Issue of Planting Material.*—The Bandirippuwa and Ratmalagara nurseries provided about the same number of seedlings in 1946 as in 1944 and 1945.

1944 ..	16,706
1945 ..	16,429
1946 ..	16,299

In addition 69,883 seednuts were issued. A large proportion of this planting material was supplied through Government officers to Colonists, and an arrangement was made with the Department of Agriculture for the better co-ordination of such supplies.

(iii) *Co-operative Activities.*—(a) *Yield recording* of selected mother palms on private estates was extended to three more estates, bringing the total to 24. There must be a large increase in this work if the output of planting material is to be increased. The extension of nurseries is by comparison a simple matter.

(b) *Experimental Plantation No. 1.*—At the end of 1946, observations on the emergence and opening of spathes were discontinued as the palms were becoming inconveniently tall for such work.

The usual crop records were kept.

Again in 1945 and early 1946 drought conditions were experienced and during 1946 leaf droop was common, and immature nutfall was heavy. Details of crops are given in previous reports; for convenience a full summary is here given for the years 1940 to 1946.

Period after transplantation.	Year.	No. of palms in bearing.	Percent. of total No. (292)	No. of Nuts.	Average per palm.	Average per acre.
6th year	1940	20	6.8	191	9.5	36
7th year	1941	159	54.4	2,440	15.3	460
8th year	1942	247	84.6	11,320	45.8	2136
9th year	1943	288	98.6	14,880	51.7	2807
10th year	1944	291	99.7	15,410	53.0	2908
11th year	1945	291	99.7	11,835	40.7	2233
12th year	1946	291	99.7	12,790	44.0	2413

First bunch Vs. Second bunch nuts.—The 292 palms of this plantation form the progeny of nine high-yielding palms in the same estate (Marandawila Estate, Bingiriya). Besides the aim of studying the segregation of characters in the progeny, the layout is designed to compare the performance of plants from first and second bunch nuts.

The usual practice is to harvest coconuts every two months. As palms bear on an average twelve fruit bunches a year, there will be plucked at each harvest two bunches, one approximately a month more mature than the second. The view has been expressed that nuts of the second or less mature bunch are preferable as seed to those of the first bunch (cf. G. Pandittesekera, "Coconut Nurseries." *Trop. Agric. (Ceylon)*, 1914, 43, 195-196).

Experiments in the nurseries at Bandirippuwa gave preliminary results in favour of the first bunch and the recommendations of the Coconut Research Scheme Leaflet No. 1, p. 4 are:—

- (a) Only dead ripe nuts should be used for seed.
- (b) First bunch nuts are better than second bunch nuts. But if two bunches must be cut, make sure that the husks of the second bunch nuts have turned brown. Do not use third bunch nuts for seed.

In the present trial nuts from first and second bunches are compared, and the following table shows the comparative total yields of the two lots:

No. of palms.	1940.	1941.	1942.	1943.	1944.	1945.	1946.	Total 1940-1946.	Total 1942-1946.	Average per palm 1946.
1st bunch	147	41	1089	5616	7623	7671	6012	6440	34492	33362
2nd bunch	145	150	1351	5704	7257	7739	5823	6350	34374	32873
Total	292	191	2440	11320	14880	15410	11835	12790	68866	66235
										45.4

It will be apparent that any initial differences in performance have evened out as the palms come into full bearing.

It is a pleasure again to record our appreciation of the courtesy of Messrs. H. L. de Mel & Co. in allowing us full use of this area for field trials.

Experimental Plantation II.—In the Annual Report for 1943 (*Ceylon Government Sessional Paper IV*.—1945, pp. 8-9) an account was given of the difficulties encountered in establishing seed at stake in a soil heavily infested with termites. Termite damage and depredations by wild animals were heavy and frequent supplying of vacancies was necessary every year. As a result the stand was so little uniform as to make the area useless for a statistical experiment. It was therefore abandoned as far as experimental purposes were concerned and taken over by the Estate.

C. Soil Chemist's Department.—

(i) *Field Experiments.*—(i.) *N. P. K. Experiment—Bandirippuwa Estate.*
(a) The yield data for 1946, the eleventh year of the experiment, are as follows:

		Lbs. copra.	Calculated as per acre.	percentage.
N_0	..	1427	..	100
N_1	..	1490	..	104.4
N_2	..	1400	..	98.1
P_0	..	1456	..	100
P_1	..	1420	..	97.5
P_2	..	1440	..	98.9
K_0	..	1186	..	100
K_1	..	1498	..	126.3
K_2	..	1633	..	137.7

Significant difference 98 lbs. per acre. NK interaction is significant and is negative.

(b) *The Potash Response.*—The progressive increase in yield due to potash manuring is shown below calculated as lbs. copra per acre:

Year.	($K_1 - K_0$)	($K_2 - K_0$)
I. 1936	.. 26	.. 50
II. 1937	.. 47	.. 80
III. 1938	.. 47	.. 114*
IV. 1939	.. 28	.. 120*
V. 1940	.. 190*	.. 249†
VI. 1941	.. 122†	.. 196†
VII. 1942	.. 352†	.. 470†
VIII. 1943	.. 300†	.. 407†
IX. 1944	.. 362†	.. 546†
X. 1945	.. 329†	.. 422†
XI. 1946	.. 312†	.. 447†
Total 11 years	.. 2,115	.. 3,101
Mean per annum	.. 192	.. 282

* Significant P.05

† Significant P.01

(c) *The Nitrogen Response.*—In last year's report were recorded the increments of yield due to Nitrogen manuring expressed as lbs. Copra per acre up to 1945, the tenth year of the experiment.

It was noted that at the higher level there has been a rapid fall in the response after the fifth year. In the eleventh year under review a negative (but insignificant) response at the higher level was obtained for the first time as shown by the following figures:—

($N^1 - N^0$)	($N^2 - N^0$)
63	-27

(d) *Influence of Manuring on Copra Out-turns.*—The following data show that the influence of manuring on copra out-turns for the experimental year under review:—

	Copra out-turn		Difference.
	Number of nuts per candy.		
N^0	.. 1350	..	—
N_1	.. 1390	..	40
N_2	.. 1464	..	114
P_0	.. 1390	..	—
P_1	.. 1391	..	1
P_2	.. 1421	..	31
K_0	.. 1480	..	—
K_1	.. 1384	..	96
K_2	.. 1359	..	121

As previously recorded in 1944 (Sessional Paper I.—1948, page 11) Nitrogen affected the out-turn adversely, i.e., more nuts were required to produce a candy of copra; for N^2 the difference averages about 114 nuts per candy compared with 75 nuts previously recorded for the 8th year;

On the other hand, potash improves the out-turn to a similar degree.—

(ii) *Co-operative Experiments.*—(a) *Southern Province (Ahangama) and Western Province (Siyane Korale).*

The following Table summarises the results of the seventh year of these two experiments:—

Southern Province.						
Treatments.	Nuts per acre.	Lbs. copra per acre.	Per cent.	Copra out-turn.		
O ..	958	383	100	..	1,400	
NK ..	1793	768	200	..	1,308	
NPK ..	2551	1115	291	..	1,282	

Western Province.

Treatments.	Nuts per acre.	Lbs. copra per acre.	Per cent.	Copra out-turn.
O ..	556	177	100	.. 1,759
*NK ..	657	243	137	.. 1,516
†NPK ..	1291	463	262	.. 1,561

* Originally NK, now NPK since November, 1945.

† Originally NPK, now NK since November, 1945.

Influence of Manuring on Female Flowers and Setting of Nuts.—

The following are the data for 6 picks of the Western Province Experiment:

Totals of 12 Plots of 18 Palms each.

Pick I (12-1-1946.)				Pick II (23-2-1946.)			
Treatments.	Nuts.	Female Flowers.	Per Cent. set.	Nuts.	Female Flowers.	Per Cent. set.	
O ..	306	974	31.4	293	856	.. 34.2	
NK ..	370	1087	34.0	345	973	.. 35.5	
NPK ..	482	2149	22.4	727	2217	.. 32.8	

Pick III (7-5-1946.)				Pick IV (11-7-1946.)			
Treatments.	Nuts.	Female Flowers.	Per Cent. set.	Nuts.	Female Flowers.	Per Cent. set.	
O ..	703	1254	56.1	660	1225	.. 53.9	
NK ..	777	1503	51.7	780	1399	.. 55.8	
NPK ..	1443	2913	49.5	1549	2944	.. 52.6	

Pick V. (10-9-1946.)				Pick VI (12-11-1946.)			
Treatments.	Nuts.	Female Flowers.	Per Cent. set.	Nuts.	Female Flowers.	Per Cent. set.	
O ..	386	857	45.0	93	395	.. 23.5	
NK ..	459	964	47.6	152	436	.. 34.9	
NPK ..	976	2264	43.1	491	1025	.. 47.9	

The data for the Southern Province Experiment are given below:—

Totals of 12 Plots of 18 Palms each.

Pick I. (6-6-1945.)				Pick II (7-8-1945.)			
Treatments.	Nuts.	Female Flowers.	Per Cent. set.	Nuts.	Female Flowers.	Per Cent. set.	
O ..	1069	2151	49.7	964	2082	.. 46.3	
NK ..	2150	4269	50.4	1766	3500	.. 50.5	
NPK ..	3599	6789	53.0	2322	4852	.. 47.9	

Treatments.	Pick III (22-10-1945.)			Pick IV (15-12-1945.)		
	Nuts.	Female Flowers.	Per Cent. set.	Nuts.	Female Flowers.	Per Cent. set.
O	558	1387	40.2	309	908	34.0
NK	1054	2498	42.2	678	1753	38.7
NPK	1201	3458	34.7	926	2611	35.5

Pick V. (19-2-1946.)						
Treatments.	Nuts.	Female Flowers.	Per Cent. set.			
O	549	1481	37.1			
NK	808	1925	42.0			
NPK	1137	3193	35.6			

N.B.—Only 5 picks were recorded in this experimental year.

(b) *Manurial Experiment on young Palms—Nattandiya*.—Two leaf coconuts were done during the year in January and June 1946.

The mean number of leaves developed per palm for the periods July 1945 to January 1946, and January 1946 to June 1946 is recorded below for each treatment:—

Number of leaves developed per Palm from July, 1945, to January, 1946.

	O	N.K.	N.P.K.	Mean.
O	4.83	5.24	4.97	5.01
Cover	4.45	4.37	4.88	4.57
Mean	4.64	4.80	4.93	4.79

Number of leaves developed per Palm from January, 1946, to June, 1946.

	O	N.K.	N.P.K.	Mean.
O	3.37	3.58	3.64	3.53
Cover	3.32	3.18	3.62	3.37
Mean	3.35	3.38	3.63	3.46

None of the manurial treatments nor "Cover" Vs. "No Cover" treatments is significant.

In December, 1946, 35 palms were in flower. One palm was in bearing and 12 nuts were picked during two picks in July and September 1946.

The distribution of palms in flower according to treatments is as follows:—

	O	N.K.	N.P.K.	Total.
O	6	13	3	22
Cover	5	2	6	13
Total	11	15	9	35

(iii.) *N. P. K. Cultivation Experiment (Ratmalagara)*.—Three years yield recording was completed in June 1946. The data after analysis will be presented in the 1947 Report.

(iv.) *Cover Crop Experiment (Bandirippuwa)*.—The mean yields for the treatments expressed as lbs. copra per acre statistically analysed and corrected by the method of covariance are recorded below for the 9th year ending June 1946.

No. Cover	Treatment.	Lbs. copra per acre.		
		N.P.K.	K.	N.K.
Cover	N.P.K.	1470	1475	1442
Cover	K.	1442	1442	1239
Cover	N.K.	1442	1442	1566
Cover	P.K.	1239	1239	119.3
Cover	N.P.	1566	1566	142.0
Standard error				
Significant Difference				
P.05				

As in previous years the only significant difference is shown by N. P., thus confirming the importance of potash.

2. Laboratory Investigations.—

Potash Content of Coconut Water of the Nuts of the NPK manurial Experiment.—The main laboratory investigation was a comprehensive study of the potash content of the water of the nuts from the 54 plots of the NPK Manurial experiment, in order to see if there is a correlation between potash content in the water and manurial response.

From 1937 to 1942 the potash content of nut water was determined in the 16 plots receiving no potash and double doses of potash (1.50 lbs. K₂O) * (vide Annual Reports 1937 to 1942). As these data could not be subjected to rigid statistical analysis it was decided to determine the potash in all the 54 samples.

The data for five picks of 1946 are recorded below:—

Potash in Coconut Water—Totals of 18 Plots, in GMS.

Date of Pick.	K ₀ No. po- tash.	K ₁ 0.75 lbs. K ₂ O per palm.	K ₂ 1.50 lbs. K ₂ O per palm.	N ₀	N ₁	N ₂	P ₀	P ₁	P ₂
27/ 2/1946	.. 178.95	.. 371.54	.. 488.07	.. 365.96	.. 374.98	.. 297.62	.. 340.08	.. 355.04	.. 343.44
9/ 7/1946	.. 433.09	.. 854.88	.. 1227.67	.. 901.92	.. 930.00	.. 683.72	.. 915.01	.. 807.73	.. 792.90
29/ 8/1946	.. 256.54	.. 542.61	.. 754.33	.. 514.69	.. 541.37	.. 497.42	.. 554.52	.. 477.95	.. 521.01
15/10/1946	.. 163.20	.. 332.21	.. 438.02	.. 316.67	.. 343.81	.. 272.95	.. 302.07	.. 300.49	.. 330.87
16/12/1946	.. 272.90	.. 479.42	.. 640.01	.. 502.44	.. 483.25	.. 406.64	.. 454.20	.. 442.64	.. 495.49

The corresponding mean yields of copra are given below:—

Mean yields of Copra (lbs.)—Totals of 18 Plots.

Date of Pick.	K ₀	K ₁	K ₂	N ₀	N ₁	N ₂	P ₀	P ₁	P ₂
27/2/1946	.. 1091..	.. 1328..	.. 1409..	.. 1288..	.. 1272..	.. 1268..	.. 1223..	.. 1305..	.. 1300
9/ 7/1946	.. 1544..	.. 1951..	.. 2132..	.. 1900..	.. 1952..	.. 1775..	.. 1950..	.. 1861..	.. 1816
29/ 8/1946	.. 1037..	.. 1396..	.. 1520..	.. 1277..	.. 1351..	.. 1325..	.. 1370..	.. 1267..	.. 1316
15/10/1946	.. 755..	.. 957..	.. 1033..	.. 890..	.. 952..	.. 903..	.. 909..	.. 897..	.. 939
16/12/1946	.. 941..	.. 1142..	.. 1172..	.. 1076..	.. 1124..	.. 1055..	.. 1063..	.. 1070..	.. 1122

In the potash manured plots the potash content of the coconut water shows an almost linear increment with increasing doses of potash applied to the soil.

This is very similar to the increment of yield (copra) of palms due to the corresponding applications of potash.

The changes in potash content of the water due to nitrogen manuring does not, however, show a similar trend between the 1st (0) and 2nd levels (0.5 lb. Nitrogen per palm), while between these levels an increase of yield of copra is obtained; no such change occurs in the potash content. With the higher level (1 lb. Nitrogen per palm), there is a depression of this yield which, however is reflected in a similar trend in the potash content at the N₂. The mechanism of the fall in yield due to excess nitrogen may be due to reduced potash uptake.

Phosphoric acid at both single and double levels showed no statistically significant differences in yield, and this is similarly reflected in the potash content of the coconut water of the corresponding plots.

The work herein reported appears to be sufficiently promising to be developed for diagnostic purposes as a guide to potash manuring and in further studies on the mechanism of potassium absorption by the coconut palm.

5. (i) Publications.—

Supplement to the 1945 Memorandum of the Board of Management on the Future of the Coconut Research Scheme (Ceylon), pp. i.+3.

R. Child. Review of C. M. Suter's "Organic Chemistry of Sulfur". *Current Science*, 1946, **15**, 55.

The first two parts of Dr. M. L. M. Salgado's "Recent Studies on the Manuring of Coconuts in Ceylon", originally read to the Ceylon Association of Science on May 18, 1945, were published in *The Tropical Agriculturist*, 1946, **102**, 149-154; 206-218. The third and concluding part is expected to appear in the first quarter's issue of *The Tropical Agriculturist* for 1947, and the whole paper will later be reprinted as Coconut Research Scheme Bulletin No. 6.

Leaflets.—A revised issue of leaflet No. 12 “ Notes on the manuring of Coconut Palms ” was published in February, 1946.

M. L. M. Salgado. “ The Use of Lime and Salt for Manuring ‘Coconut Palms ’”, C. R. S. Leaflet No. 13, August, 1946. Also a Sinhalese translation by the author.

Press Articles.—Dr. Salgado’s lecture to the Chilaw Planters’ Association on March 22, 1946, “ New Developments in Coconut Manuring ” was reprinted in *The Times of Ceylon* of March 27, 1946. A Sinhalese translation by the author appeared in the April-June 1946, number of *Govikam Sangarawa*, Volume XLI., No. 2, pp. 38-51.

Dr. R. Child, Director, contributed to the Centenary number of *The Times of Ceylon*, July 13, 1946, an article on “ The Coconut Industry’s Hundred Years ”, and his address to the Low Country Products Association on July 18, 1946, was reproduced in *The Times of Ceylon* of July 19, 1946, under the title “ The Coconut Industry has a bright Future ”.

(ii) *Library*.—On December 31, 1946, the Library contained 660 books and 1,141 bound volumes of periodicals (including 131 loaned by the Director). Purchase of Volumes 8 to 18 (1889-1899) of *The Tropical Agriculturist (Ceylon)* completed the Library’s set of this Journal. Considerable progress was made in binding back numbers of journals, among them being volumes of *Chemical Abstracts* (published by the American Chemical Society), the Library set of 83 volumes being complete from Volume 14, 1920.

The usual general acknowledgment is here made to Government Departments and Research Organizations overseas which send exchange publications. It is hoped to renew several pre-war contacts in 1947, and to make particular acknowledgements in next year’s report.

Visitors are welcome to use the Library for reference on week-days between 9 a.m. and 12 noon and 2 to 4 p.m. (Saturdays 9 a.m. to 12 noon; not on Sundays and Public Holidays).

6. (i) **Lectures during 1946.—**

The Director gave the following public lectures during 1946:—

18th July	... To the Low Country Products Association. “ The Future Development of the Coconut Industry.” (See para 5 (i).)
13th August	... To the University of Ceylon Chemical Society on “ Margarine ”.
31st August	... To the Chemical Society of Ceylon on “ Coconut Water ”.
15th November	... To the Ceylon Economic Society on “ The Costs of Production of Coconuts and Copra in Ceylon.”

(This lecture will be published in the *Ceylon Economic Journal* early in 1947.) The Soil Chemist addressed the Chilaw Planters’ Association at its Annual General Meeting on March 22, on “ Some New Developments in Coconut Manuring ” (See para 5 (i)), and the Low Country Products Association, November 21, on “ Some Aspects of Coconut Manuring ”.

(ii) *Meetings*.—The Director attended the Annual General Meeting of the Planters Association of Ceylon at Kandy on March 15, and of the Low Country Products’ Association in Colombo on March 30, 1946. He also attended two meetings of the Central Board of Agriculture.

The staff officers of the Scheme attended meetings of the Low Country Products’ Association, the Chilaw Planters’ Association and the Kurunegala Planters’ Association during the year. The Scheme’s library was made available to the Chilaw-Negombo Planters’ Association for their meetings on three occasions.

(iii) *Visitors*.—In August three members of the newly formed Indian Central Coconut Committee—Rao Sahib A. K. Menon, Mr. K. R. Narayan Iyer and Mr. K. Gopalan (Secretary)—visited Ceylon to study the Coconut Industry, particularly the organization of research in this country. A programme of visits

to estates and factories was organized by the Coconut Research Scheme and successfully carried out on August 22 to 25, one full day being spent at Bandirippuwa.

THE ESTATES.

7. Bandirippuwa Estate. —

Crops harvested in 1946 were as follows:—

Crop No.	Nuts from Estate Blocks.	Nuts from Research Blocks.	Total.	Average 1931-1946.	1946—above or below average.
I	46,758	20,051	66,809	67,826	— 1.5 per cent.
II	116,909	30,017	146,926	111,083	† 32.3 „ „
III	97,391	31,204	128,595	132,148	— 2.7 „ „
IV	81,976	23,479	105,455	118,177	— 10.8 „ „
V	52,936	14,489	67,425	76,891	— 12.3 „ „
VI	56,792	14,489	71,281	61,828	† 15.3 „ „
	452,762	133,729	586,491	567,953	† 3.3 per cent.

The revenue from Bandirippuwa estate actually accruing in 1946 was—

Revenue from Estate Management.			Revenue from Research Management.		
Crops 1945—	Rs. c.	Rs. c.	Crops 1945.	Rs. c.	Rs. c.
Sale of nuts ..	5,177 31		Sale of copra ..	2,267 67	
Sale of copra ..	920 75				2,267 67
		6,098 6			
<i>Crops 1-5, 1946—</i>			<i>Crops 1-5, 1946—</i>		
Sale of copra ..	3,000 48		Sale of copra ..	6,579 54	
Sale of nuts ..	21,362 41		Sale of nuts ..	790 13	
		24,362 89			7,369 67
Sale of husks ..	2,483 89		Seednuts for		
Sale of shells ..	39 40		Nursery ..	1,211 11	
		2,523 29			1,211 11
Seednuts to Nursery ..	5,759 38				
		5,759 38			
Sale of food crops ..	69 23				
Sundries ..	119 39				
		188 62			
		38,932 24			
					10,848 45

Total gross revenue in 1946 was thus Rs. 49,780.69, which may be summarized as follows:—

	Rs. c.	Average price.
Sale of 364,979 nuts realizing ..	27,329 85	Rs. 74.89 per 1,000 nuts
Sale of 33 tons 2 cwt. 94 lbs. of copra realizing ..	12,768 44	Rs. 96.32 per candy
Sale of 75,984 seednuts to nursery realizing ..	6,970 49	Rs. 91.74 per 1,000 nuts
Sale of 505,112 husks realizing ..	2,483 89	Rs. 4.92 per 1,000 husks
Sale of 19,700 shells realizing ..	39 40	
Sale of food crops ..	188 62	
	49,780 69	

Expenditure for the year totalled Rs. 14,981.09 for the estate area, Rs. 2,340.03 for the research area. Estate receipts, therefore, exceeded expenditure by Rs. 23,951.15 and research receipts exceeded expenditure by Rs. 8,508.42

Cost of production of nuts on the estate area (including copra curing, transport expenses and depreciation on copra kiln) was Rs. 32.59 per 1,000 nuts.

SUNDY DEBTORS AND CREDITORS ACCOUNT.

Of the income actually accruing in 1946 and included in the above statement, Rs. 6,098.06 (estate) and Rs. 2,267.67 (research) from 1945 crops, had been credited to the Estate Working Account for 1945 through Sundry Debtors Account. The Estate Working Account for 1946 does not, therefore, include these sums.

The following amounts have been credited to the Estate Working Account on account of 1946 crops lying unsold at the end of the year:—

	Rs. c.
1946 5th and 6th crops Estate ...	7,482 04
1946 5th and 6th crops Research ...	1,629 92
	<hr/>
	9,111 96

The Bandirippuwa Estate Working Account for 1946 thus shows a balance of Rs. 33,205.80 carried forward to Revenue.

Meteorological Observations at Bandirippuwa Estate.—Extra aviation readings were discontinued on February 11, 1946. Thereafter were kept the usual routine observations at 0800 h. and 15.30 h., Ceylon Standard Time (0230 h. and 1000 h., G.M.T.) The morning observations are telegraphed to the Colombo Observatory, the Civil Airport and the R. A. F. Station. Monthly abstracts of all observations are sent to the Colombo Observatory.

During 1946, 97.89 inches of rain fell on 170 rainy days; wet days (0.04 inch or more of rain) numbered 132. The corresponding figures for 1945 were 72.13 inches falling on 127 rainy days (99 wet days).

Drought conditions prevailed at the beginning of the year, only 0.63 inches of rain falling between December 19, 1945, and March 15, 1946, a partial drought of 87 days. During this spell the weather was particularly hot and dry by day, and a maximum temperature of 100.0°F was recorded on March 8, 1946, the highest since records commenced in May 1932. Copious rain (totalling 57.19 inches) fell in the last three months of the year.

8. Ratmalagara Estate.—

Crops harvested in 1946 are shown in the following table, with the figures from 1938 to 1945 for comparison.

Crop No.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.	Average 1938-1946	
1..	30,896*	23,752	22,302	29,153	21,718	25,504	33,163	36,706	44,601	29,756	
2..	28,130	26,413	16,391	38,285	26,478	37,197	52,912	47,987	71,117	38,323	
3..	37,413	30,160	28,233	49,339	39,218	55,008	64,634	61,248	52,300	46,395	
4..	44,180	34,278	25,704	60,232	44,584	56,378	58,152	39,175†	35,479	44,240	
5..	34,573	32,515	37,000	45,606	39,205	48,978	52,719	35,191†	29,548	39,482	
6..	20,945	23,865	20,800	29,682	22,958	36,230	29,066	28,473	24,978	26,333	
	<hr/>	<hr/>									
	196,137	170,983	150,430	252,297	194,161	259,295	290,646	248,780	258,023	224,529	

* Harvested by previous proprietor.

† Only five crops were harvested in 1945. The fourth crop taken in October, 1945, and totalling 74,366 nuts really represented the 4th and 5th combined; for comparative purposes the 74,366 have been distributed in the ratio of previous averages for the 4th and 5th crops.

The revenue actually accruing during the year was—

Revenue from Estate Management.	Revenue from Research Management.
<i>Crops 1945.</i>	<i>Crops 1945.</i>
Rs. c.	Rs. c.
Sale of nuts .. 1,760 96	Sale of copra .. 426 66
Sale of copra .. 35 68	
	<hr/>
1,796 64	426 66
<i>Crops 1-5, 1946—</i>	<i>Crops 1-5, 1946—</i>
Sale of nuts .. 6,996 83	Sale of copra .. 3,078 64
Sale of copra .. 5,463 84	
	<hr/>
12,460 67	3,078 64
Sale of food crops .. 593 14	Sale of pines .. 655 99
Sundries .. 102 35	
	<hr/>
695 49	655 99
14,952 80	566 0
	<hr/>
	4,727 29

Total gross revenue in 1946 was thus Rs. 19,680.04 which may be summarised as follows:—

	Rs. c.	Average price.
Sale of 124,479 nuts realizing	9,144 11	Rs. 73.46 per 1,000 nuts.
Sale of 21 tons, 16 cwt. 101 lb. of copra realizing	8,618 50	Rs. 98.64 per candy
Sale of 10,933 lb. of pineapples realizing	655 99	Rs. 00.06 cents per lb.
Sale of food crops	593 14	
Refund on citrus nursery and rubber seed garden	566 0	
Sundries	102 35	
	19,680 9	

Expenditure for the year totalled Rs. 12,982.75 for estate area and Rs. 2,028.31 for research area.

Cost of production of nuts on Estate area (including copra curing and transport expenses) was Rs. 59.64 per 1000 nuts.

SUNDAY DEBTORS AND CREDITORS ACCOUNT.

Of the income actually accruing in 1946 and included in the above statement, Rs. 1,796.64 (estate) and Rs. 426.66 (research) from 1945 crops, had been credited to the Estate Working Account for 1945 through Sundry Debtors Account. The Estate Working Account for 1945 does not, therefore, include these sums.

The following amounts have been credited to the Estate Working Account on account of 1946 crops lying unsold at the end of the year:—

	Rs. c.
1946 crops Estate (copra)	3,921 14
1946 crops Research (copra)	951 4
	4,872 18

The Ratmalagara Estate Working Account for 1946 thus shows a balance carried forward to Revenue of Rs. 7,317.91.

Weather Records.—The usual records were kept of rainfall and of hours of bright sunshine (on the Campbell-Stokes recorder installed in January, 1941). Rainfall in 1946 totalled 69.67 inches falling on 136 rain days. The corresponding figures in 1945 were 57.15 inches on 93 rain days. January and February were very dry (0.41 inch.), as were July and August (0.74 inch.); otherwise rainfall was reasonably well distributed. 42.72 inches fell in the last three months of the year.

Hours of bright sunshine averaged daily 7.0. Previous figures were 1943—6.7; 1944—6.9; 1945—7.7.

9. Visiting.—

Mr. B. Parker, Visiting Agent, inspected the estates on 12/13th March and 22/24th August 1946. His reports were circulated to the members of the Board of Management.

10. Finance.—

The audited statements of accounts for 1946 are appended.

D. RHIND,
Director of Agriculture and Chairman,
Board of Management, Coconut
Research Scheme.

May 19, 1948.

2—J. N. A 80407 (6/48)

Statement of Receipts and Disbursements for the Year ended December 31, 1946.

(In Compliance of Section 8(2) of Ordinance No. 29 of 1928.)

RECEIPTS.	Rs. c.	DISBURSEMENTS.	Rs. c.
Balance at January 1, 1946	22,976 29	Capital account :	
A.—Revenue Account :		New clearing	298 69
Annual grant from Government	30,000 0	Laboratory equipment	2,426 7
Cess collections for 1946	27,965 15	Depreciation reserve	1,603 79
Interest	3,672 53	Office furniture	52 0
Income from Bandirippuwa estate—		Estate draught animals	460 0
Estate area	32,491 18	Personal emoluments :	
Research area	8,580 78	Salaries to senior staff	45,628 59
Income from Ratmalagara estate—		Salaries to junior staff	19,277 65
Estate area	13,139 72	Rent allowance	1,275 54
Research area	4,020 70	War allowance	17,542 74
Sale of publications	74 30	Provident fund bonus and interest for 1946	8,018 92
Sale of planting material	31,692 45	Other charges :	
Charges to staff for electricity	904 50	Travelling expenses to staff	6,163 75
Sundry receipts	205 54	Travelling expenses to board members	1,945 25
Rental telephone	81 64	Office :	
B.—Advance account :		Entertainment allowance	68 14
Repayments of loan by staff	3,579 11	Stationery	1,034 94
Rice, sugar and chillies	3,188 85	Postages	881 22
Kerosene oil	93 61	Printing and advertising	2,547 46
Bulbs	116 0	Legal expenses	286 75
General stores	743 25	Incidental expenses	869 50
Fertilizer's advance account	1,731 87	Telephone rental	395 0
C.—Reserve accounts :		Workmen's compensation insurance	88 85
Staff contributions to provident fund	4,709 3	Maintenance of office equipment	579 0
Scheme's bonus and interest	8,018 92	Laboratories :	
D.—Sundries :		Upkeep, chemicals, &c.	5,550 88
Sundry debtors	21,126 94	Scientific books and periodicals	3,706 5
Bank reconciliation as at December 31, 1946:	No. 1 Ac. No. 2 Ac.	Buildings :	
Balance as per cash book (O/D)	3,152 9	Upkeep	6,118 61
Add. value of uncashed cheque	8,541 60	Insurance	539 44
Less Crs not credited	5,389 51	Running expenses of electrical plant	2,423 32
(O/D)	6,760 53	Estates—Bandirippuwa :	
Shortag	1,371 2	General charges	3,798 27
(O/D)	2,393 44	Upkeep	1,271 46
(O/D)	3,764 46	Food crops	249 70
	1,324 11	Cultivation and manuring	2,621 51
		Collection	2,072 22
		Ratmalagara estate :	
		General charges	4,111 67
		Upkeep	1,540 17
		Food crops	1,327 32
		Cultivation	2,645 91
		Collection	1,290 47
		Research :	
		General	583 92
		Genetical work	3,227 63
		Soil chemist's work	6,104 49
		Purchase of planting materials	18,211 3
		Advance Accounts :	
		Rice, sugar and chillies	3,069 45
		Kerosene oil	77 37
		General stores	1,824 68
		Fertilizers	2,371 83
		Bulbs	12 0
		Investments :	
		Ceylon Savings Bank	4,614 78
		Ceylon Savings Certificates	663 87
		Sundries :	
		Suspense creditors	12 41
		Loans to staff	6,247 0
		Sundry creditors	2,569 6
		Refund of provident fund contributions	13,964 8
			214,264 45
		Rs. c.	
		Balance at December 31, 1946, No. 1 a/c	5,545 53 (O/D)
		Add shortage	2,393 44
			3,152 9 (O/D)
		No. 2 account	6,000 0
		Petty cash imprest	2,000 0
			4,847 91
			219,112 36

S. C. KAHAWITA,
Secretary-Accountant,
Coconut Research Scheme, Lunuwila.
January 23, 1947.

Ratmalagara Estate Working Account for 1946.

To Estate expenses :	Rs. c.	Rs. c.	By income :	Rs. c.	Rs. c.
Superintendent and watchers ..	2,716 67		Estate area :		
General charges ..	2,776 75		Sale/nuts ..	6,996 83	
Upkeep ..	1,540 17		Sale of copra ..	9,384 98	
Food crops ..	1,363 14				16,381 81
Cultivation and manuring ..	2,975 21		Research area :		
Picking and collection ..	1,467 52	12,839 46	Sale/nuts ..	566 0	
			Sale of copra ..	4,029 68	
Research expenses on Estate account :					4,595 68
General-O-Research I ..	526 0		Others :		
Genetical work : Research II ..	505 31		Food crops ..	593 14	
Soil Chemist's work : Research III ..	997 0	2,028 31	Sundries ..	102 35	
			Pine apples ..	655 99	
Reserve:					1,351 48
Depreciation on H. A. Drier ..	143 29	143 29			
To balance carried forward to revenue account		7,317 91			
		22,328 97			22,328 97

Bandirippuwa Estate Working Account for 1946.

To Estate expenses :	Rs. c.	Rs. c.	By Income :	Rs. c.	Rs. c.
Superintendent, conductor and watchers ..	3,691 89		Estate area :		
General charges ..	2,601 78		Sale of nuts ..	27,470 53	
Upkeep ..	1,271 46		Sale of copra ..	10,133 78	
Food crops ..	254 60				37,604 31
Manuring and cultivation ..	4,135 11		Research area :		
Collecting and picking ..	2,610 32	14,565 16	Sale of nuts ..	2,001 24	
			Sale of copra ..	8,209 46	
Research expenses on Estates account :					10,210 70
General: Research I ..	36 94		Others :		
Genetical work : Research II ..	606 76		Food crops ..	69 23	
Soil chemists work : Research III ..	1,696 33	2,340 3	Sundries ..	2,642 68	
					2,711 91
Reserves :					
Depreciation on pat. drier ..	327 8				
Workmen's insurance ..	88 85	415 93			
To balance carried forward to revenue account		33,205 80			
		50,526 92			50,526 92

Nursery Working Account for 1946.

To Purchase of seednuts	Rs. c.	Rs. c.	By sale of planting material :	Rs. c.	Rs. c.
Pluck of seednuts ..	13,157 8		Seedlings sold in 1946 ..	6,915 20	
Transport of seednuts ..	133 70		Booked and paid in advance ..	2,536 50	
	1,759 25	15,050 3			9,451 70
Nurseries :			Less refunds in 1946 ..	260 0	
To Prepr. selec. and Mn. ..	1,543 98		Seednuts sold in 1946 ..	11,624 5	
Rep. and pump ..	22 50		Booked and paid in advance ..	9,300 0	
Incidentals ..	17 7	1,583 55			20,924 5
Nursery Attendants :			Trans. charges :		
To Salaries ..	1,241 37		Recovery in 1946 ..	869 45	
D/A ..	1,235 40		Paid in advance ..	447 25	
Tavelling allowances ..	922 25				1,316 70
Rent allowances ..	70 50	3,469 52			
Miscellaneous :					
To Harbour dues ..	56 7				
Gunnies ..	339 13	395 20			
To Balance carried forward to revenue account		10,934 15			
		31,432 45			31,432 45

Capital Expenditure Account for 1946.

	Rs. c.	Rs. c.		Rs. c.	Rs. c.
To New Clear Research	298 69				
Laboratory equipment	2,426 7		By balance transferred to revenue		
Draught animals	460 0		account	3,236 76	
Office furniture	52 0				
		<u>3,236 76</u>			<u>3,236 76</u>

Revenue Account for 1946.

EXPENDITURE.	Rs. c.	Rs. c.	INCOME.	Rs. c.	Rs. c.
To Personal emoluments :			By Government grant for 1946	30,000 0	
Salaries senior staff	45,628 59		Cess collections for 1946	29,870 23	
Salaries junior staff	14,744 58		Interest on investments	4,785 58	
Provident Fund bonus and interest	8,018 92		Charges to staff for electricity	897 84	
Rent allowance	1,029 6		Sale of publications	74 30	
Dearness allowance	14,893 25	<u>84,314 40</u>	Sundries	205 54	
			Credit balance bulb advance account	7 39	
				<u>65,840 88</u>	
To Other charges :			Nursery working account brought forward	10,934 15	
Staff travelling	6,186 65		Bandirippuwa estate working account brought forward	33,205 80	
Board travelling	1,945 25	<u>8,131 90</u>	Research work account brought forward	7,317 91	
			Deficit carried forward to balance sheet	<u>51,457 86</u>	
					21,334 7

To Office:

Stationery	1,034 94
Postage	881 62
Printing and advertising	2,547 46
Legal expenses	286 75
Incidentals	869 50
Telephone	313 36
Entertainment allowance	68 14
Maintenance of office equip- ment	579 0
Cost of audit	1,053 76
	<u>7,634 53</u>

To Laboratory and Library :

Upkeep, chemicals, &c.	5,566 88
Books and periodicals	3,706 5
	<u>9,272 93</u>

To Buildings:

Upkeep	6,398 59
Insurance	539 44
Running expenses of elec- trical plant	2,427 32
	<u>9,365 35</u>

To Research :

Research I	263 48
Research II	3,817 54
Research III	4,076 60

To Research Fund Pass	1,000 0
Depreciation on buildings	7,519 32
	<u>8,519 32</u>

To Capital expenditure brought forward	3,236 76
	<u>3,236 76</u>
	<u>138,632 81</u>

138,632 81

Balance Sheet as at December 31, 1946.

LIABILITIES.				ASSETS.	
		Rs.	c.	Rs.	c.
Capital outlay :					
Previously ..	..	606,105	87	Buildings	
In 1946 ..	..	3,236	76	Bandirippuwa estate	.. 187,554 68
				Ratmalagara estate	.. 73,138 0
					.. 260,692 68
Passage fund :				Animals :	
Previously ..	..	2,695	11	Previously	Rs. c.
In 1946 ..	..	1,000	0	1946 ..	1,800 0
					460 0
					.. 2,260 0
Provident fund :				Improvements to	estates
At December 31, 1945 ..	..	55,328	3	previously	8,942 13
In 1946 ..	..	12,727	95	In 1946 ..	298 69
					.. 9,240 82
Less refunds in 1946 ..	..	68,055	98	Bandirippuwa kiln.	.. 4,067 26
		13,964	8	Ratmalagara kiln.	.. 1,432 91
					.. 5,500 17
Depreciation reserve :				Buildings—Laboratory	64,297 31
At December 31, 1945 ..	..	108,927	52	Equipment previously	.. 32,244 75
Less contribution from revenue				In 1946 ..	.. 2,426 7
in 1946 ..	..	1,603	79		.. 34,670 82
					3,436 83
Transferred in 1946 ..	..	107,323	73	Gas plant :	
		7,989	69	Furniture : Bungalows	.. 5,398 44
				Office previously	.. 2,139 72
				In 1946 ..	.. 52 0
					.. 7,590 16
Sundry creditors :				Accumulators :	
Sundries ..	..	2,344	68	Museum	
Suspense account ..	..	871	29		.. 17,503 61
					.. 276 20
				Sundry debtors :	
				Cess collections ..	.. 1,905 8
				Interest accrued ..	.. 684 25
				B.E. working account ..	.. 9,454 96
				R.E. working account ..	.. 5,168 55
					.. 17,212 84
				Advance accounts :	
				Fertilisers ..	.. 100 80
				Rice, sugar, &c. ..	.. 305 40
				Transport loans ..	.. 2,863 84
				General stores ..	.. 971 83
					.. 4,241 87
				Investments :	
				Ceylon Government 3½ per cent.	
				loan ..	.. 59,400 0
				Home Defence loan ..	.. 15,000 0
				New Government loan ..	.. 20,000 0
					.. 94,400 0
				P. F. Investments :	
				Bank of Ceylon S.D. ..	.. 10,000 0
				Savings Certificates ..	.. 19,475 79
				Ceylon Savings Bank ..	.. 19,979 24
				Home Defence loan ..	.. 5,000 0
					.. 54,455 3
				Cash in hand :	
				Bank of Ceylon No. 1 account ..	.. 5,545 53(O. D.)
				Less shortage ..	.. 2,393 44
					.. 3,152 9 (O. D.)
				Rs.	
				Bank No. 2 account ..	.. 6,000
				P.C. imprest ..	.. 2,000
					.. 8,000 0
					.. 4,847 91
				Deficit for 1946 brought forward	
				from revenue account ..	.. 21,334 7
				Surplus from previous balance	
				sheet ..	.. 20,175 32
					.. 1,158 75
					.. 785,659 3

S. C. KAHAWITA,
Secretary-Accountant,
Coconut Research Scheme.

The accounts of the Coconut Research Scheme above set forth have been audited under my direction. I have obtained all the information and explanations that I have required and I certify as a result of this audit that, in my opinion, the balance sheet is properly drawn up so as to exhibit a correct view of the affairs of the Scheme.

Audit Office,
Colombo, April 23, 1948

Sgd. P. W. KAULE,
for Auditor-General.

