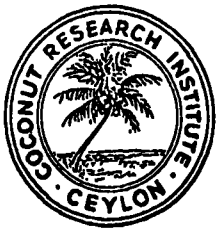

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THE CEYLON COCONUT QUARTERLY

A JOURNAL
devoted to
SCIENCE AND PRACTICE
of
COCONUT CULTIVATION

Editor : M. L. M. SALGADO, Deputy Director
and
Soil Chemist, Coconut Research Institute

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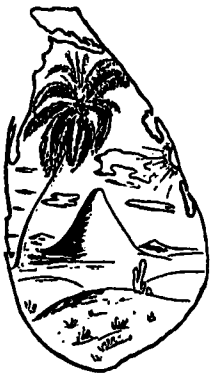
THE CEYLON COCONUT QUARTERLY

EDITORIAL

ANNUAL STOCK TAKING



Hitherto it has been the practice to publish the Annual Reports as a Sessional Paper; in accordance with the requirements of the Coconut Research Ordinance No. 29 of 1928, the Annual Reports and Accounts together with the Auditor General's Report have to be tabled in Parliament and then subsequently published as a Sessional Paper, as required by law.

Owing to circumstances beyond our control, particularly during the war years and even the post-war years, due to the heavy demands on the Auditor General's Department, the auditing of our accounts and the final submission of the Auditor General's Report is often an year late or even more. This placed us in a situation of grave embarrassment; for no fault of ours we delay to give an account of our stewardship.

At the moment of writing, while the Technical Officers' Reports have been ready for publication along with the Chairman's Report and the Director's Summary, the publication is being delayed as the Auditor General's Report has not yet been forwarded to the Board.

In view of this inevitable delay, it has now been decided to publish the main bulk of the Annual Report for 1955 (which was in fact ready by June of this year in its finalised form) as a combined January/June, 1956 number of the *Ceylon Coconut Quarterly* (Vol. VII, Nos. 1/2).

Not only does this relieve the Editor of the burden and responsibility of collecting material for publication to keep up the Quarterly in its regularity of issue to its naturally impatient subscribers, but also gives the Technical Officers of the Institute an opportunity to put out their achievements during the previous year before the scientific world and to an impatient and critical planting public, with the utmost expedition.

In an age when it is imperative that results of scientific investigations should be translated to practical reality with the least time lag, expeditious publicity is the *sine-qua-non* of efficient Public Relations work. Otherwise all our researches, as His Excellency the Governor-General, Sir Oliver Goonetilleke so forthrightly stated in his address declaring open the Technical Conference of the Coconut Research Institute in August, 1955 (and published in the last issue of the *Ceylon Coconut Quarterly*, Coconut Research Institute Conference Number), becomes an academic exercise.

To quote him : ' Research without the proper application of the results of research is merely an academic exercise. In this scientific age, the gap between the scientist and the lay-man is growing steadily wider. It is becoming increasingly necessary for scientists to work in limited fields in order to make advances, and the fundamental sciences are dividing and redividing into specialist's fields. With every fresh advance, scientific literature is becoming increasingly unintelligible not only to the lay-man, but also for specialists in other fields '.

We are pleased to record with satisfaction that the Technical Officers' Reports are couched in the barest minimum of scientific jargon consistent with clarity of diction and scientific precision that our work demands.

It must be noted at the same time that the reports of Technical Officers have of course to cater also to the scientific world at large—their competent critics, as colleagues of the wider *Scientific International Freemasonry*, which knows no political or racial limitations or boundaries —as these alone can use their yardsticks to assess the work objectively and dispassionately.

None the less it is the function of a *Crop Research Institute* not to forget that the final translation of scientific work has to be weighed in the Economic Balance—and the yardstick of profits and losses, of cost of production per 1,000 nuts, of Rupees and Cents, in terms of the grim realities of what the diversified coconut economy can do and cannot do, will not do and will be advised to do ; what new advances a *Propaganda and Advisory Division*, if such a division can translate their advice into practical realities, can commercialise just as commercial travellers and Insurance Agents sell their new products and new policies.

The reference to Insurance tempts our Editorial pen to draw an analogy or clear parallel between Insurance and Research. The main purpose of Insurance, in accordance with the good intentions of their voluble agents, is to look after our unstable lives, and the future and prosperity of our dependants—wives and children—obligations to whom we, in the tempo of our lives today buffeted by an impossible cost of living and the evanescent glories of modern life, may forget.

Similarly the Coconut Research Institute after a lapse of two decades and five years since its inauguration, with history of a chequered career, once almost insolvent, has now reached a condition of reasonable financial security, with the provision of a reasonably not too ungenerous a cess that the Industry gladly pays, and a modest Government grant which no organisation however solvent today can afford to despise.

The Coconut Research Institute is a vast National Mutual Coconut Insurance Corporation (unlimited)—not Ltd., whose beneficiaries are the vast array of proprietors, proprietory planters, absentee landlords, middle-class owners, smallholders, peasant allotees of ' Pilot Schemes ', owners of village gardens, and the vast army of superintendents, conductors, kanganies, and that unknown array of labourers, nearly all sons and daughters of the soil, of this ancient land of ours, and not birds of passage—but those who have an intimate stake in the land on which that ever perennial palm perpetuates its prolific existence, supplying the fat, carbohydrate and protein needs (and even vitamin needs in toddy) and nut water, to the peoples of this country living and yet unborn.

The Technical and other officers of the Coconut Research Institute are the Trustees of this great army of policy-holders who pay their premia by an export duty called a CESS.

Finally it is realised that the Government of the country, and especially a Government whose policy is that of nationalisation of land, must surely have a great stake in the Coconut Industry of this country—that represents the largest acreage of any economic crop.

It will therefore be evident to all those who may not have realised it that this Annual Report published in a popular form is more of a business report to the vast number of our subscribers who represent the shareholders and policy-holders of the largest Insurance Organisation of Sri Lanka's Economic Security—the Coconut Research Institute of Ceylon.

ANNUAL REPORT FOR 1955

The present report is the Twenty-Seventh Annual Report of the Coconut Research Institute which was established by Ordinance No. 29 of 1928 dated December 1928.

REPORT OF THE CHAIRMAN

On January 1st, 1955 the Coconut Research Board consisted of the following :—

(*a*) **Ex-officio Members :**

Chairman : The Director of Agriculture, Dr. A. W. R. Joachim, *O.B.E.*, Ph.D., B.Sc. (Lond.).

Treasury Representative : Mr. W. D. Gunaratne, *C.C.S.*

Chairman, Low Country Products Association : Mr. S. Pathmanathan.

Director, Coconut Research Institute : Mr. F. C. Cooke, A.R.C.S., B.Sc. (Lond.), A.M.I.Chem.E., *E.D.*

Senators and Members of the Parliament nominated by the Hon. Minister :

Mr. N. H. Keerthiratne, *M.P.*, Mr. R. Singleton-Salmon, *M.P.*, *C.B.E.*

Representatives of the Low Country Products Association :

Mr. R. H. de Mel, Mr. Wace de Niese.

Representatives of the Planters' Association :

Mr. A. W. Warburton Gray, Mr. C. T. Van Geyzel, *J.P.*

Representatives of the Small-holders nominated by the Hon. Minister :

Mr. E. Muttukumaru, *J.P.*, Mr. C. A. M. de Silva.

Dr. A. W. R. Joachim was away from the island on a F.A.O. mission during the last quarter of the year. Dr. W. R. C. Paul, Acting Director of Agriculture acted as Chairman of the Board during this period.

Mr. W. D. Gunaratne, *C.C.S.*, was succeeded by Mr. E. B. Wiratunga, Deputy Controller of Finance as from 28th February, 1955.

Mr. C. A. M. de Silva was succeeded by Mrs. L. J. de S. Seneviratne on 31st March, 1955.

Mr. S. Pathmanathan was succeeded by Senator E. W. Kannangara, *C.B.E.*, *J.P.*, as from 28th March, 1955.

Mr. N. H. Keerthiratne and Mr. R. Singleton-Salmon, *M.P.*, *C.B.E.*, were renominated for a further period of three years.

Mr. E. Muttukumaru was granted leave of absence during the first quarter of the year owing to ill-health, and again from 8th June to 10th August on account of his participation in the Trade Mission to Europe.

Mr. Wace de Niese and Mrs. L. J. de S. Seneviratne were away from the island on a holiday during the month of December.

His Excellency the Governor-General, Sir Oliver Goonetilleke, *G.C.M.G., K.C.V.O., K.B.E.*, unveiled the memorial plaque on 29th August, which commemorated the Silver Jubilee of the Institute and the completion of the laboratories.

Meetings.—Eight meetings of the Coconut Research Board were held during the year—25th February, 26th March, 28th May, 12th August, 18th October, 8th November, 12th November (emergency) and 9th December.

Committees

Administration Committee—Personnel at 1st January :

1. Dr. A. W. R. Joachim, Chairman
2. Mr. C. A. M. de Silva
3. Mr. Wace de Niese
4. Mr. S. Pathmanathan
5. Mr. W. D. Gunaratne, *C.C.S.*
6. Mr. F. C. Cooke, Director, Coconut Research Institute.

Thirteenth and 14th meetings were held on 19/5 and 15/10.

Research Committee—Personnel at 1st January :

1. Mr. R. H. de Mel, Chairman
2. Dr. A. W. R. Joachim
3. Mr. C. T. Van Geyzel
4. Mr. E. Muttukumaru
5. Mr. R. Singleton-Salmon
6. Mr. F. C. Cooke, Director, Coconut Research Institute.

Thirteenth, 14th and 15th meetings were held on 19/5, 17/9 and 8/10.

Extension Committee—Personnel at 1st January :

1. Mr. Wace de Niese, Chairman
2. Mr. A. W. Warburton Gray
3. Mr. E. B. Wiratunge
4. Senator E. W. Kannangara
5. Mrs. L. J. de S. Seneviratne
6. Mr. N. H. Keerthiratne.

Twelfth and 13th meetings were held on 21/3 and 15/10.

Buildings Sub-Committee—Personnel at 1st January :

1. Mr. R. H. de Mel
2. Senator E. W. Kannangara
3. Mr. E. B. Wiratunge
4. Mr. Wace de Niese
5. Mr. F. C. Cooke, Director, Coconut Research Institute.

Three meetings were held on 3/9, 8/11 and 23/11.

Annual Report of the Director

The staff of the Coconut Research Institute at the end of 1955 was as follows :—

Administration Division

Director : Mr. F. C. Cooke, A.R.C.S., B.Sc. (Hons.), A.M.I.Chem.E., *E.D.*
Secretary/Accountant : Mr. S. C. Kahawita, B.Com. (Lond.).

Soil Chemistry Division

Soil Chemist : Dr. M. L. M. Salgado, Ph.D. (Cantab.), B.Sc. (Lond.), Dip. Agric. (Cantab.).
Research Assistant to Soil Chemist : Mr. D. A. Nethsinghe, B.Sc. (Cey.), A.R.I.C.

Chemistry Division

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

Botanist Division

Botanist : Dr. D. V. Liyanage, Ph.D. (Manch.), B.Sc. (Lond.).
Research Assistant to Botanist : Mr. C. A. Wickramasuriya, B.Sc. (Cey.).

Agronomy Division

Agronomist : Mr. T. B. Paltridge, B.Sc. Hons. (Adelaide), Colombo Plan.
Research Assistant to Agronomist : Mr. K. Santhirasegaram, B.Sc. (Hons.), (Cey.).

Industrial Research

Industrial Research Assistant : Mr. A. Maheswara, B.Sc. (Cey.).

Planting and Advisory Division

Planting Officer : Mr. P. D. L. Fernando.
Assistant Planting Officer : Mr. C. W. S. de Silva.

Public Relations

Public Relations Officer : Mr. L. R. N. H. Perera.

Crop Protection

Crop Protection Assistant : Mr. J. K. F. Kirthisinghe.

Animal Husbandry

Animal Husbandry Officer : Mr. G. C. M. Goonesekera.

Agri-Meteorology Station

Technical Assistant : Mr. V. Abeywardene.

Superintendents of Estates

Superintendent, Bandirippuwa Estate : Mr. D. F. Withana.
Superintendent, Ratmalagara Estate : Mr. H. J. F. Peiris.

Mechanic

Senior Mechanic : Mr. R. Werapermall.

Mr. T. B. Paltridge, Agronomist (Colombo Plan) assumed duties on 12th August, 1955.

Dr. M. L. M. Salgado, Soil Chemist who was away in Australia on a Senior Fellowship awarded under the Colombo Plan for Technical Co-operation to study soil surveys at the Commonwealth Scientific and Industrial Organisation resumed duties on 25th March.

Mr. G. C. M. Goonesekera was also away in Australia on a Colombo Plan Fellowship for a course of training in Animal Husbandry at the Queensland Department of Agriculture.

Mr. W. R. N. Nathanael, Chemist, Dr. D. V. Liyanage, Botanist, Mr. P. D. L. Fernando, Planting Officer, Mr. D. A. Nethsinghe, Research Assistant to Soil Chemist, Mr. M. A. P. P. Manthiriratne, Technical Assistant to Botanist and Mr. J. K. F. Kirthisinghe, Crop Protection Assistant were away for two weeks to visit the Coconut Research Stations in India.

Mr. V. Abeywardene, Technical Assistant (Computer), underwent a course of training in meteorology at the Colombo Observatory, and in statistics at New Delhi the scholarship being awarded by the F.A.O.

Mr. A. W. Middleditch, audio-visual expert, was assigned for a period of one month to the Coconut Research Institute under the Colombo Plan to train the personnel of the Institute in photography and methods of display and instruction.

Field Days.—The Coconut Research Institute was represented at the following field days:

All Ceylon Stock Show held on 4th and 5th March at Negombo.
Field Day and Exhibition at Udupila on 2-7-55.
Agricultural Livestock and Industrial Exhibition at Kadawata on 29-7-55.
Binara Mela Exhibition at Marawila on 10-9-55.

The Institute was visited by their Excellencies the High Commissioners for the United Kingdom, Canada and Australia.

The Director and staff participated in the following opening ceremonies, which were attended by Ministers of State :—

The Isolated Seed Garden at Ambakelle on 23rd April, 1955.
The New Carmel Nursery at Kurunegala on 14th October, 1955.

Conferences.—The following conferences were held during the year:

Second Technical Conference of the Institute on 7th March, presided over by Hon. Mr. S. C. Corea, Minister of Commerce, Trade and Fisheries.

Dr. V. T. Venkatraman, Visiting Entomologist, of the South Pacific Commission addressed the members on Pests and Diseases, and a discussion followed on the subject of his talk.

Coconut Conference on 29th August presided over by His Excellency the Governor-General, Sir Oliver Goonetilleke, *C.M.G., K.C.V.O., K.B.E.* The following papers were read before the Conference.

'The Commercial Possibilities of Manufacturing High Grade Vinegar from Coconut Toddy'—by Mr. W. R. N. Nathanael, Chemist, Coconut Research Institute.

'Planting Material for Coconuts'—by Dr. D. V. Liyanage, Botanist, Coconut Research Institute.

'Some New Aspects of Coconut Manuring'—by Dr. M. L. M. Salgado, Soil Chemist, Coconut Research Institute.

'Agronomy and the Coconut Industry'—by Mr. T. B. Paltridge, Agronomist, Colombo Plan.

A conference of the Technical Officers and Advisory Field Officers of the Institute was held on 10th May.

A conference of the staff and the Indian Research Officers was held on 17th December.

A conference of the Technical Officers and Advisory Officers of the Institute was held on 21st December to outline the policy and the programme of work in connection with the Rehabilitation of the Coconut Industry.

The Coconut Research Institute was represented at the Eleventh Biennial Conference of the Tea Research Institute held in March.

Meetings and Articles.—The Director and Technical Staff attended the Annual General Meetings of the Kurunegala Planters' Association on 19/2 and the Chilaw-Negombo Planters' Association on 17/3.

The Director contributed the following articles to the press :

(i) ' Milk Production on Coconut Estates ' to the Special Supplement of the Press to mark the formal opening of the Milk Pasteurising Plant of the Colombo Co-operative Milk Union.

(ii) ' The Future of the Coconut Research Institute ' to the Industrial Supplement of the *Ceylon Daily News.*

(iii) ' Research and the Coconut Industry ' lecture to the Southern Province Planters' Association.

Publications.—The following publications in English and Sinhalese have been produced.

' The Commercial Possibilities of Manufacturing High Grade Vinegar from Coconut Toddy '—by Mr. W. R. N. Nathanael, Chemist, Coconut Research Institute.

' Planting Material for Coconuts '—by Dr. D. V. Liyanage, Botanist, Coconut Research Institute.

' Some New Aspects of Coconut Manuring '—by Dr. M. L. M. Salgado, Soil Chemist, Coconut Research Institute.

' Agronomy and the Coconut Industry '—by Mr. T. B. Paltridge, Agronomist (Colombo Plan), Coconut Research Institute.

' Research and the Coconut Industry '—by Mr. F. C. Cooke, Director, Coconut Research Institute.

' Coconut Rehabilitation Project ' (in Sinhalese) —by Mr. L. R. N. H. Perera, Public Relations Officer, Coconut Research Institute.

The monthly Sinhalese Journal entitled ' Pol Pawath '—by Mr. L. R. N. H. Perera, Public Relations Officer, Coconut Research Institute.

Welfare.—The following committees of management have been actively engaged in the development of welfare work of the staff of the Institute which has considerably increased with the implementation of the Institute's re-organisation proposals.

Medical Aid Fund.—Personnel at 1st January :

Mr. F. C. Cooke, Chairman
Mr. S. C. Kahawita
Mr. W. R. N. Nathanael
Mr. F. H. B. Felix Silva, Secretary
Mr. M. M. Perera.

Twelve meetings were held during the year and 203 applications for aid have been approved for payment at these meetings. A panel of doctors have been appointed to enable the members

to obtain credit and other facilities for their benefit. The Medical Aid Fund which has been operating since January 1954 is working very satisfactorily although it is now apparent that it will be necessary to revise the rates of contribution to the Fund as the present rate of Rs. 5/- for senior staff and Rs. 3/- per month for the junior and minor staff are not really enough to meet hospitalisation claims, especially in the case of married officers with children.

Recreation Club.—Personnel at 1st January :

Mr. F. C. Cooke, President
Mr. F. H. B. Felix Silva, General Secretary
Mr. R. B. Rodrigo, Tennis Secretary
Mr. T. S. Balakrishnamurtie, Indoor Games and Badminton Secretary
Dr. D. V. Liyanage, Vice-President
Mr. G. W. M. Wijetunge, Treasurer
Mr. V. Abeywardena, Cricket Secretary
Mr. J. K. F. Kirthisinghe, Library Secretary.

Two general meetings and two committee meetings were held during the year. The Recreation Club provides recreational facilities to all members and the necessary equipment is supplied from the funds of the club and from an annual grant made by the Coconut Research Board. Cricket became very popular this year as the club entered the Government Services Tournament. An excursion to Nawalapitiya was arranged in March and several members and their families participated. At the end of the year there was a very successful social, sports meet, Christmas tree and variety entertainment which was attended by the officers and their families; all the children of all those employed in the office and estate were given gifts.

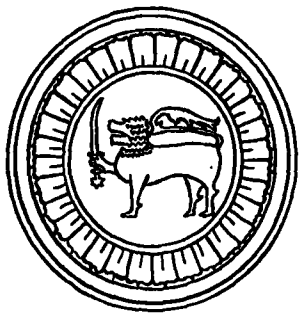
Coconut Research Institute Co-operative Welfare Society Ltd.—Personnel at 1st January, 1956 :

Mr. S. C. Kahawita, President
Mr. K. C. de Pinto, Vice-President
Mr. C. W. S. de Silva, Vice-President
Mr. F. H. B. Felix Silva, Secretary
Mr. M. B. S. Kurera, Treasurer, and
Messrs. G. W. M. Wijetunge, V. Abeywardena, O. D. J. Wanasinghe and D. F. Withana.

Two general meetings and nine committee meetings have been held during the year. The Society was registered under the Co-operative Societies Ordinance of 1936 of Chapter 107 as amended by Act No. 21 of 1949 on 28-6-55 and started its business on 1st July. A current and savings account at the Bank of Ceylon have been opened and several members have contributed to the Savings Deposit Account of the Society. Eighty-six applications for loans have been approved for payment to members during the year. The main functions of the Society have been to encourage thrift and savings, by providing means whereby such savings may receive a reasonable interest without risk and without having removed from the control of members and to afford relief to members in need by enabling them to obtain loans for useful or really necessary purposes at reasonable interest and with easy terms of repayment, to afford advancement of loans to the stores and canteen sections and to do all such things as are incidental or conducive to promote the economic interest of its members. The Committee of Management is now contemplating to obtain financial assistance from the Coconut Research Board for the establishment of a holiday home, long-term housing loans and furniture and equipment for a stores and canteen.

REVIEW OF THE WORK OF THE COCONUT RESEARCH INSTITUTE IN 1955

General



Following the increase in the cess for research in late 1954, plans for expanding the scope of the research work of the Coconut Research Institute, recruiting and training technical officers, and improving its advisory and propaganda services were at once begun. A two-storey extension to provide additional office and laboratory accommodation was completed in less than eight months and it was formally opened by His Excellency the Governor-General Sir Oliver Goonetilleke, *G.C.M.G., K.C.V.O., K.B.E.* on August 29th in the presence of a large and distinguished gathering who subsequently attended the Technical Conference of the Institute.

Three officers have been sent on overseas study leave: Dr. M. L. M. Salgado, Soil Chemist (Australia); Mr. V. Abeywardene, Meteorologist and Computor (India). The Board has also approved study leave for Mr. D. A. Nethsinghe, Research Assistant (Soils) who will be leaving for England, early in 1956.

Exchange visits between technical officers of the Coconut Research Institutes of India and Ceylon, which also have been arranged, have provided valuable information and useful personal contacts. Six Coconut Research Institute officers were sent to India and four came from India to Ceylon.

Mr. T. B. Paltridge, Agronomist (Colombo Plan) has joined the staff during the year to study the development and management of pastures under coconuts under various climatic and soil conditions and the wider problem of maintaining and improving the fertility of poor and exhausted coconut soils. Mr. A. W. Middleditch, a Colombo Plan Expert in audio-visual training gave instruction to senior officers of the Institute for a period of one month.

Mr. L. R. N. H. Perera, Public Relations Officer, was appointed to co-ordinate the publicity of the Institute and to present to the public the results of research. He is acting as assistant Editor of the *Ceylon Coconut Quarterly* and as Editor of *Pol Sangharawa* and *Pol Pawath*, and will be responsible for the issue of planting leaflets in three languages.

Altogether the year 1955 has been one of great activity, unparalleled in the history of the Institute, a year of change, transition and rapid expansion. Nevertheless research has not been neglected and replanting has far exceeded the programme laid down by the Board, but in spite of this, demand for selected seedlings continues to exceed supply.

Botanical Division

The following research problems were under investigation during the year: systems of replanting, size of planting holes, methods of mass selection, progeny trials of hybrid crosses, variations in seedling characters, cytological examination of roots and flowers, control of the rhinoceros beetle.

An apparently satisfactory cross has been obtained between the tall (typica) and the dwarf palm (nana) in which the latter is the male parent. The palms are vigorous and early flowering ; the first crop is obtained in the fifth year, the nuts are of medium size and the derived copra is of good quality. Further work is required to prove this cross.

Work on the Isolated Seed Garden in Ambakelle Forest Reserve has proceeded according to plan. When completed this 200 acre estate of high-yielding mother palms will eventually supply seednuts for the whole of Ceylon. Planting with selected seedlings produced by the controlled pollination of high-yielding parent palms has been started. This incidentally is a project which is unparalleled in any other coconut-producing country.

Soil Chemistry Division

Work in this division mainly consists of long-range research. The following field experiments were continued ; N.P.K. manurial experiment on old palms (Bandirippuwa—twentieth year) ; N.P.K. manurial experiment on young palms (Ratmalagara—sixth year) ; N.P.K. manurial experiment on underplanted palms (Letchemy Estate—sixteenth year) ; manurial-cultivation experiment (Ratmalagara—sixth year) and methods of application trials (Marandawila—sixth year).

The manurial experiment at Letchemy has proved conclusively that the application of a complete mixture is essential prior to replanting. The original control (no treatment) plots which are now also being manured are responding well.

The manurial experiment with young palms at Ratmalagara in which N.P.K. fertilizers are applied at three levels are now showing striking differences. At Marandawila, the method of application trials show that there is no significant difference between ring-manuring and broadcasting under the conditions prevailing in this estate, but this important conclusion does not of course apply to all conditions under which coconuts are grown in Ceylon.

In the laboratory, the analysis of coconut waters to determine the nutrient uptake and the phosphate availability in the soil is being continued. A study of soil nitrogen is also in progress.

In the field, systematic soil surveys have been carried out to determine the suitability of new lands for coconut cultivation under various Colonisation Schemes. Out of 30,000 acres inspected, 25,700 acres have been approved for coconuts.

Division of Agronomy

This new division was only initiated in September. Preliminary trials with selected pasture grasses and two comprehensive nutrient trials, using all the known plant foods have commenced on two estates. A modern greenhouse, specially designed for work with trace elements, for the determination of the nutrient status of soils by means of indicator plants, is under construction. The purpose is to determine what are the nutrient deficiencies in Ceylon coconut soils.

Plant Chemistry

The following empirical trials which will be supported by foliar analysis were laid down during the year :—application of ' fritted ' trace elements to seedlings (Andigama), treatment of yellow palms with calcium, magnesium and boron (Maliduakande), similar treatment of healthy palms (Ratmalagara), mounding of yellow palms to induce new root-growth (Waterland).

A set of 12 giant concrete cylinders to serve as flower pots for the hydroponic cultivation of coconut seedlings in pure sand, were mounted in position and trials will shortly commence. Major and minor nutrients will be added to the sand and the object is to determine the complete nutrient requirements of the coconut palm.

Crop Protection Division

This division has been established and is being maintained for routine advisory work pending the arrival of the Crop Protection Adviser (Colombo Plan). It has been found that rhinoceros beetle larve can be effectively controlled by applications of either Shell soil fumigant or Dieldrex in breeding grounds.

Technological Chemistry

Research work on the new vinegar process has continued and a total of 50 charges of coconut toddy has now been put through the pilot plant. The overall average strength was 7.3 per cent which is over double that produced by the crude and now obsolete vat process, which unfortunately, is still being followed in most of the vinegar factories in Ceylon.

The improved product has a full aromatic flavour and is uniformly good in colour, clarity and bouquet and in every way equal in quality to the best imported vinegars. The cost of production of this coconut vinegar is considerably less than that of the imported article, so that the protective duty is more than adequate. The generator process is far quicker, more efficient, and simpler to operate than the vat process and occupies nine times less factory space.

The new process is now being adopted by three established manufacturers using generators of 50 and 150 gallon capacity and the initial results are very promising. It is expected that other licensed manufacturers will follow suit. Serious consideration can thereafter be given to the establishment of a sauce and pickle industry based on the fruits, vegetables, spices, vinegar and salt, all produced in Ceylon.

An inexpensive copra kiln for smallholders or for decentralised copra production on estates has been designed and is now in operation at Bandirippuwa Research Station. The new kiln has the following advantages :—

1. Low capital cost
2. Low running and maintenance charges
3. Easy to operate
4. Rapid drying
5. High efficiency.

Although the kiln is small in size and constructed only of the simplest materials, its efficiency is such that it will produce in half the time, copra of a much superior quality to that from an ordinary Ceylon kiln.

The kiln has a maximum capacity of only 1,500 nuts per charge but it cannot be increased in size without impairing its efficiency. However, it is possible for estates to adopt decentralised production, save the heavy cost of transporting whole nuts to the copra yard and leave the husk and shell ash in the field where they are needed. The recommended arrangement is one kiln in every 25 acre block.

Animal Husbandry

It has been proved that milk can be produced at a profit from ordinary Sinhala cattle if the animals are given 2 lb. of 'morlac' or parings poonac and are grazed rotationally. The animals also become healthier, heavier and stronger.

The black herd at Bandirippuwa is now in splendid condition and has reached the third generation of selective breeding within five years. The animals are individually recorded and history sheets are maintained for each.

Bandirippuwa Estate is being planted with *Bracharia brizantha* and *Bracharia milliformis*, and Napier and Guinea grass. At Ratmalagara, the drought-resisting *Bracharia brizantha* is planted on the high land and Napier grass in the low-lying areas. In addition there is of course ordinary mixed grazing available at both stations.

Climate and Crop

The Biometrician has now been made responsible for the maintenance of the records of the meteorological station at Bandirippuwa and for the establishment of sub-stations in areas, which at present appear to be marginal for coconuts. The object is to place this work on a true research footing, to determine exactly the optimum and limiting conditions for coconuts and to examine statistically the variations in crop and the characteristics of the nuts with seasonal and annual variations in atmospheric and soil conditions. He will work in close co-operation with the Agronomist.

Coconut Replanting

The Coconut Replanting Project is developing satisfactorily. In 1954, about 9,000 acres were planted with Coconut Research Institute seedlings; in 1955, with the increased funds now provided, 850,000 seedlings sufficient for 13,380 acres were supplied to the public. Nevertheless, the demand for seedlings still exceeds the supply and production is being gradually stepped up so as ultimately to provide seedlings for 16,000 acres per annum. There has been no relaxation of the high standard of quality; all rejected seedlings are counted and destroyed.

Fifteen nurseries with a total capacity of 1,303,430 seednuts have been maintained during the year. In addition a new nursery, established on model lines, was formally opened by the Hon'ble J. R. Jayewardene, Minister of Agriculture and Food, at Ibbagamuwa near Kurunegala. New nurseries are also being established at Chengkaladi (E.P.) and Koggala (S.P.).

Public Relations

A new division has been established to organise the propaganda and publicity work of the Institute. An Officer, who is an expert Sinhalese scholar, has been appointed and he is responsible for all publications, posters, and the printing of advisory leaflets, and also the organisation of shows and demonstrations.

The following publications have been issued during the year :—

Research and the Coconut Industry
Proceedings of the Third Technical Conference
The Coconut Rehabilitation Project
Pol Pawath (Sinhalese)
Ceylon Coconut Quarterly, Vol. V, No. 4.

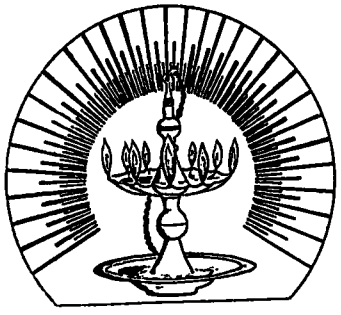
The Institute has participated in four agricultural shows in 1955.

The Coconut Industry

The coconut crop and the exports of coconut products during the past year were the highest on record,—an increase of 78 per cent over the low crop of 1947 when the steady decline in crops led to the appointment of the Ceylon Coconut Commission. This remarkable reversal in the fortunes of the industry, while it is partly to be accounted for by the favourable weather conditions in 1954, is mainly due to the good work done by estate proprietors and coconut growers during the past five years, during which period the crops have steadily improved.

REPORT OF THE SOIL CHEMIST

FIELD EXPERIMENTS



(i) 3 × 3 × 3 N.P.K. Experiment (Bandirippuwa Estate).

The twentieth year of this experiment was completed in November 1955. The tenth biennial manuring was completed in November 1955. As in the ninth manuring the stepped up potash levels remained the same since the manuring in November 1951,

K_0 is K_1— .75 lbs. K_2O
K_1 is K_2—1.50 lbs. K_2O
K_2 is K_3—2.25 lbs. K_2O

For the nitrogen comparison (i.e. comparison of sulphate of ammonia, calcium cyanamide, and an oil cake). Sediment Poonac was used containing 6 per cent nitrogen as ground nut cake was not available.

The yield data for the main effects for 1955 are given below :—

Nitrogen	*Lb. copra per acre*	*Calculated as percentage*	*Difference in lb.*	*Copra outturn nuts per candy*
N_0	2,078	100	—	1,089
N_1	2,159	104	81	1,109
N_2	2,069	100	—9	1,149
Phosphoric Acid				
P_0	2,044	100	—	1,089
P_1	2,122	104	78	1,124
P_2	2,140	105	96	1,132
Potash				
K_0 (Now K_1)	1,851	100	—	1,166
K_1 (Now K_2)	2,172	117	321	1,105
K_2 (Now K_3)	2,282	123	431	1,083

Significant difference (P .05)—147 lb. per acre.

Nitrogen at the higher level yet continues to cause a depression in yield.

Phosphoric Acid. Continues to produce no significant response.

1379—B

PALM MANURED WITH N.P.K.

Potash. With the change in the potash levels as from November 1951, the yields of the original K_0 plots (now K_1) have now been considerably stepped up as shown below :—

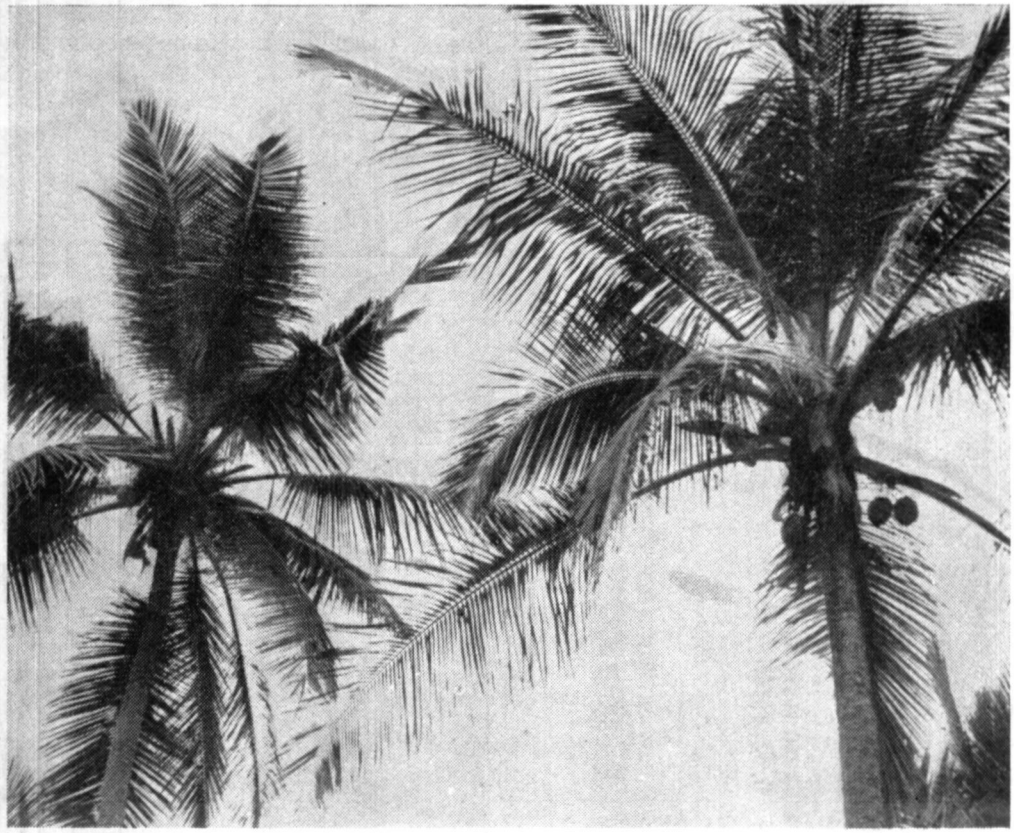
	(*Lb. copra per acre*)			
	1952	1953	1954	1955
K_0	1,195	1,267	1,326	1,851
K_1	1,742	1,588	1,837	2,172
K_2	1,994	1,704	2,040	2,282

The foliage of the original K_0 plots have now turned green and the new fronds show improved vegetative growth.

Potash Response

No.	*Year*	*Lb. copra per acre* K_1—K_0	K_2—K_0
1	1936	26	50
2	1937	47	80
3	1938	47	114*
4	1939	28	120*
5	1940	190*	249†
6	1941	122	196†
7	1942	352†	196†
8	1943	300†	407†
9	1944	362†	546†
10	1945	329†	422†
11	1946	312†	447†
12	1947	382†	512†
13	1948	442†	582†
14	1949	401†	546†
15	1950	542†	711†
16	1951	664†	846†
17	1952	547†	799†
18	1953	321†	437†
19	1954	511†	714†
20	1955	321†	431†
	Total for twenty years ..	.. 6,246	8,405
	Mean per annum	312	420

*Significant at P.05 †Significant at P.01



UN-MANURED PALMS

The mean yields (lbs per. acre)for the various treatment combinations are given in the two-way tables below :—

	N_0	N_1	N_2	*K—Total*
K_0	1,890	1,899	1,765	1,851
K_1	2,132	2,287	2,097	2,172
K_2	2,213	2,290	2,344	2,282
N—Total ..	2,078	2,159	2,069	2,102

	P_0	P_1	P_2	*K—Total*
K_0	1,818	1,863	1,874	1,851
K_1	2,157	2,141	2,218	2,172
K_2	2,155	2,363	2,328	2,282
P—Total ..	2,044	2,122	2,140	2,102

	P_0	P_1	P_2	*N—Total*
N_0	1,978	2,169	2,088	2,078
N_1	2,152	2,093	2,231	2,159
N_2	2,001	2,103	2,102	2,069
P—Total ..	2,044	2,122	2,140	2,102

(ii) K × P × C Manurial × Cultivation Experiment (Ratmalagara Estate).

The sixth biennial application of manures of this experiment was carried out in May, 1955, and the cultivation operations (ploughing) which form one of the treatment comparisons in May.

This factorial experiment includes all combinations of the following treatments and is of the 3 × 2 × 2 type and consists of 6 blocks of 6 plots each. The interactions P.C. and K.P.C. are partially confounded with block differences.

{ K_0—No potash
K_1—1 lb. K_2O per palm
K_2—2 lb. K_2O per palm } × { P_0—No phosphoric acid
P—1 lb. P_2O_5 per palm } × { C_0—No ploughing
C—ploughing once in two years at the time of manuring }

All plots are given a basic application of 3 lb. Sulphate of Ammonia per palm. The first biennial application of manures was carried out in June, 1943. The yield data for the main effects from the second year (1944-1945) up to the twelfth year are summarized below :—

Lb. per Acre

Treatment	1944-45 *2nd year*	1945-46 *3rd year*	1946-47 *4th year*	1947-48 *5th year*	1948-49 *6th year*	1949-50 *7th year*	1950-51 *8th year*	1951-52 *9th year*	1952-53 *10th year*	1953-54 *11th year*	1954-55 *12th year*
K_0	1,771	1,691	1,415	1,841	1,438	1,342	1,631	1,978	1,663	1,827	1,883
K_1	1,935	1,674	1,395	1,842	1,466	1,327	1,677	1,957	1,684	1,924	2,011
K_2	1,893	1,738	1,492	1,975	1,589	1,449	1,760	2,167	1,813	2,006	2,044
Significant difference P.05	194	152	181	215	161	173	202	123	200	264	185
T_0	1,792	1,625	1,276	1,711	1,353	1,095	1,487	1,798	1,434	1,574	1,582
	1,938	1,777	1,592†	2,061†	1,643*	1,651†	1,891†	2,270†	2,006†	2,264†	2,377†
C_0	1,783	1,615	1,372	1,851	1,450	1,320	1,654	2,020	1,708	1,942	1,977
C	1,949*	1,787†	1,496	1,921	1,547	1,426	1,725	2,048	1,732	1,896	1,981
Significant difference (.05)	158	123	149	176	131	145	165	151	163	216	151

*Significant at P.05 †Significant at .01

As before phosphate response alone continued to be marked and significant, and has now risen to a peak of 795 lb. per acre per annum.

Year	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*10th*	*11th*	*12th*
Lb./Acre ..	144	152	316	350	290	556	404	472	572	690	795

(iii) 3 × 3 × 3 N.P.K. Manurial Experiment on Young Palms (Ratmalagara).

The seventh annual manuring was carried out in October/November 1955.

The basic rates of manuring were stepped up as follows :—

Nitrogen (N_1) : Sulphate of Ammonia $\frac{3}{4}$ lb. to 1 lb. per palm.
Phosphoric Acid (P_1) : Saphos Phosphate $\frac{1}{2}$ to 1 lb. per palm.
Potash (K_1) : Muriate of Potash $\frac{3}{4}$ to 1 lb. per palm.

(*a*) *Palms in Flower :*

Up to the end of November 1955, there were 510 palms in *flower*. The distribution is shown below according to the main effects :

Palms in Flower

N_0	140	P_0	71	K_0	155
N_1	184	P_1	216	K_1	168
N_2	186	P_2	223	K_2	187

Phosphate Manuring has a marked effect on flowering.

(*b*) *Yield of Nuts :*

The distribution of *nuts* of the plot palms are shown below according to the main effects.

N_0	250	P_0	20	K_0	350
N_1	593	P_1	903	K_1	672
N_2	714	P_2	634	K_2	535

Here again the effect of phosphate is particularly striking.

(*c*) *Leaf Counts :*

Two leaf counts were done during the year 1955 in January and July. The extra leaves that emerged during the year are shown below :—

	Total leaves	*Calculated as per cent*	*Leaves per palm*
N_0	3,464	100	10.7
N_1	3,558	103	11.0
N_2	3,562	103	11.0
P_0	3,116	100	9.6
P_1	3,684	118	11.4
P_2	3,784	121	11.7
K_0	3,511	100	10.8
K_1	3,507	100	10.8
K_2	3,566	102	11.0

On leaf development too phosphate alone seems to produce a significant response.

Co-operative Manurial Experiments

(i) *Manurial Experiment on Underplanted Young Palms (Letchemy Estate, Nattandiya).*

This experiment was commenced in 1940 on underplanted palms put out in October 1939. The treatments are (*a*) Cover *vs.* No cover and (*b*) O, N.K., and N.P.K. in five randomised blocks of six plots each.

The first palm come into bearing in 1945 in the sixth year after planting. By 1952, the entire old stand was removed.

In 1955, there were 467 palms flowered (out of a total of 540) and their distribution according to manurial treatments is shown below :—

Manurial Experiment on Underplanted Young Palms

(*a*) *Palms in Flower*

Treatments	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
O.	—	12	43	68	99	119	132	136	148	153	157
N.K.	—	16	49	77	97	120	124	130	136	141	145
N.P.K.	1	12	41	75	117	135	146	154	161	164	165
Total	1	40	133	220	313	374	402	418	445	458	467

Yield data relating to number of nuts, copra and copra outturns are shown in tables (*b*), (*c*) and (*d*).

(*b*) *Yield of Nuts*

Treatments	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
O.	—	92	325	864	976	1,618	2,424	2,661	4,822	6,847
N.K.	—	87	668	1,030	1,638	2,559	3,526	4,302	6,976	8,373
N.P.K.	15	191	656	1,785	2,091	3,379	4,556	5,876	10,345	11,719
	15	370	1,649	4,279	4,705	7,556	10,506	12,839	22,143	26,939

(*c*) *Yield of Copra*

Treatments	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
O.	—	44	111	269	501	819	1,117	1,262	2,465	3,494
N.K.	—	45	281	497	878	1,417	1,846	2,159	5,771	4,496
N.P.K.	11	120	272	605	1,158	1,912	2,519	3,030	5,852	6,627
	11	209	664	1,371	2,537	4,148	5,482	6,451	12,088	14,617

(*d*) *Copra Outturns (nuts per candy)*

Treatments	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
O.	—	1,171	1,175	1,122	1,091	1,106	1,215	1,181	1,096	1,097
N.K.	—	1,083	1,158	1,084	1,045	1,011	1,070	1,116	1,035	1,043
N.P.K.	764	821	945	1,051	1,011	990	1,013	1,086	990	990

The complete mixture (N.P.K.) continues to give the highest yields and the best outturn.

(ii) Manurial Experiment on Methods of Application of Manures (Marandawila Group, Bingiriya).

This experiment is of the unreplicated 3 × 3 × 3 factorial design and consists of all combinations of N.P.K. applied in the following ways.

N_0—No nitrogen	P_0—No phosphoric acid	K_0—No potash
N_C—Nitrogen applied in circular trenches	P_C—Phosphoric acid applied in circular trenches	K_C—Potash—applied in circular trenches
N_B—Nitrogen broadcast and ploughed	P_B—Phosphoric acid broadcast and ploughed	K_B—Potash broadcast and ploughed

One years premanurial records were completed in May, 1949, and manures were applied in June 1949. So far six years data have been recorded since first biennial application of manures.

The data of the second to sixth year of this experiment statistically analysed, are shown below :—

Lb. Copra per Acre

(Yields adjusted by Covariance Analysis)

	M-II 1950-51 *Second Year*	M-III 1951-52 *Third Year*	M-IV 1952-53 *Fourth Year*	M-V 1953-54 *Fifth Year*	M-VI 1954-55 *Sixth Year*
N_0	1,917	1,493	1,436	1,337	1,934
N_C	1,929	1,561	1,563	1,496	2,145
N_B	1,835	1,538	1,500	1,476	2,064
P_0	1,833	1,416	1,400	1,343	1,901
P_C	1,907	1,575	1,560	1,491	2,132
P_B	1,941	1,600	1,539	1,476	2,111
K_0	1,814	1,482	1,401	1,408	1,874
K_C	1,938	1,472	1,528	1,418	2,116
K_B	1,929	1,639	1,570	1,484	2,154
(Significant difference P.05)	83	217	141	403	342

(Significant Responses Table on page 10).

Significant Responses

	M II	*M III*	*M IV*	*M V*	*M VI*
Nitrogen	$N_C > N_B$	None of the responses are significant	Nil	None of the responses are significant	None of the responses are significant
Phos. Acid	$P_B > P$		$P_C > P_0$		
Potash	$K_C > K_0$		$K_C > K_0$		
	$K_B > K_0$		$K_B > K_0$		

(iii) Observation Trial on Immature Nut-fall.

This simple observation experiment was commenced in November 1954, to find out the cause of round the year immature nut-fall in a smallholder's property at Hirigolla in Hettipola area. The experiment consists of four plots with 20 palms each. Two plots were kept as ' Controls ' and the other two were given the following treatment last year :—

(*a*) ¾ lb. 60 per cent muriate of potash
¾ lb. Saphos phosphate
¾ lb. Sulphate of ammonia
1 lb. Dolomite
} per palm

(*b*) Husk burying between the rows of palms.

Records of immature nuts fallen and mature nuts picked of individual palms are kept. Nut-water samples were taken from three affected and three unaffected palms to analyse for potash.

Water samples were taken from the drinking well and some of the wells closer to the land for analysis. The results of these analyses are discussed under Laboratory investigations.

(iv) Observation Plots (Bandirippuwa Estate).

An observation trial was commenced in 1950 for comparing the following five treatments :—

Plot (i) Coir dust applied at the rate of one double bullock cart load per square. In some years dry milled coir dust where the potash of the original husk is retained in the dust was applied.

Plot (ii) Control. Ploughing and disc-harrowing only.

Plot (iii) All plant products except coconut oil returned to the soil.

Plot (iv) Manuring with inorganic fertilisers only. The following mixture was applied biennially in circular trenches; Sulphate of Ammonia 3 lb.; Saphos Phosphate 2 lb.; and Muriate of Potash 2 lb.

Plot (v) Manuring with ' organic ' manures; Crushed Coconut Poonac and ash to supply 0.6 lb. nitrogen, 0.6 lb. phosphoric acid and 1.2 lb. potash (the equivalent of the mixture of inorganic fertilizers).

Each treatment consists of a *single* plot consisting of 80-90 palms.

The sixth year of this trial ended in December 1955. Given below are the yield data in nuts per acre per annum, considering the four years 1952-1955 as the effective period for a measure of the treatment effects. The data have been corrected for initial differences in the plot yields by the method of linear regression using the data for 1950 and 1951 as the premanurial period.

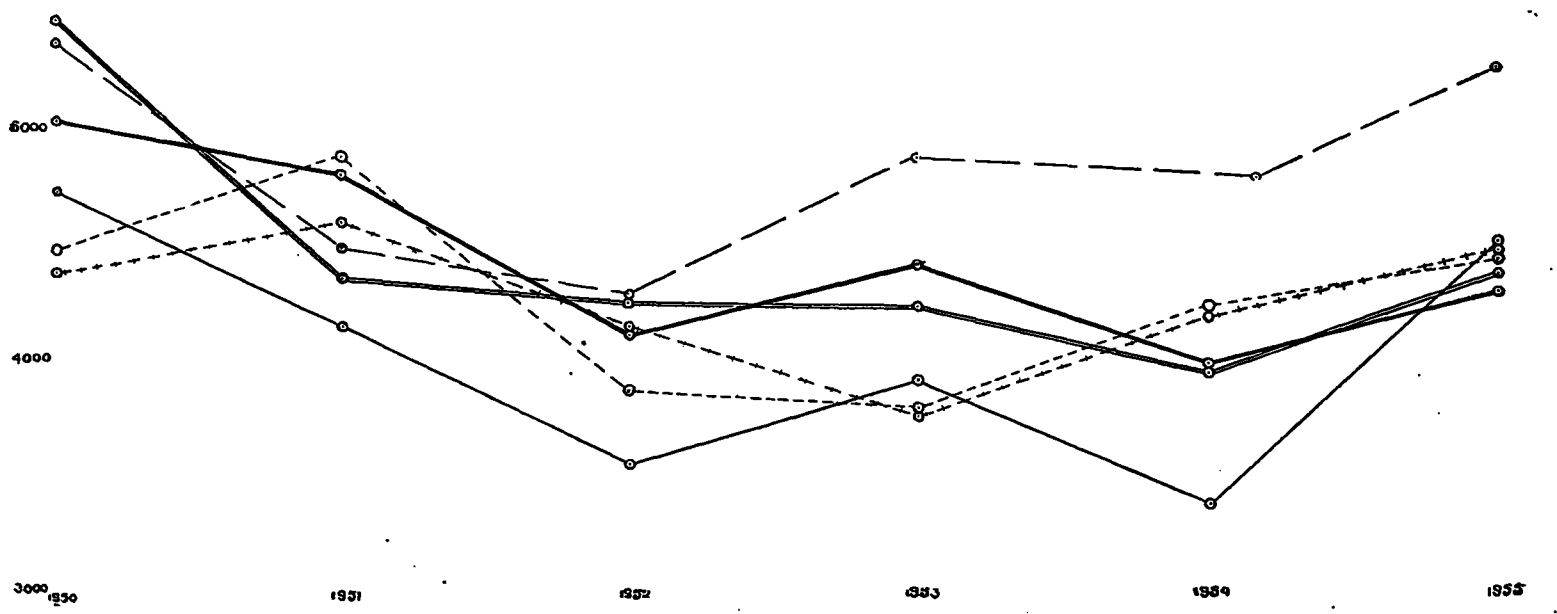
OBSERVATION PLOTS

(BANDIRIPPUWA ESTATE)

NUTS PER ACRE

TREATMENTS

PLOTS		
1	—o—	N.P.K. MANURING ENTIRELY SUSPENDED FOR 8 YEARS COIR DUST DRESSING AND HARROWED ANNUALLY.
2	—o—	CONTROL - HARROWING ONLY.
3	=o=	ALL PLANT PRODUCTS EXCEPT OIL RETURNED TO THE SOIL.
4	—o—	N.P.K. (STANDARD) MANURING WITH MINERAL FERTILIZERS.
5	---o---	CRUSHED COCONUT POONAC (20 lbs) AND ASH PER ARROW.
6	-·-o-·-	ESTATE AREA.



	Treatment	*Nuts/Acre/Annum* (1952-1955) *adjusted yields*
1.	Coir dust only	5,026
2.	Control	4,626
3.	All plant products returned to soil	4,681
4.	Inorganic manures only (NPK)	5,436
5.	Organic manures	5,202

Observation plots are of value only where spectacular differences are shown. Nevertheless there is an indication that the highest yields were obtained by the use of inorganic manures only, with ' organics ' a close second.

The unadjusted data for each year are shown graphically indicating the yield trends.

Laboratory Investigations

(*a*) *Soil Moisture Studies* (Ratmalagara Estate—Young Plantation).

Three sets of soil samples were taken for moisture estimations on 28th February, 11th and 21st March from the manure circles of guard rows palms with and without husk mulches, and also from the centres of squares—as was done earlier. The samples were taken to a depth of 9" only.

Statistical analysis of the moisture contents which were in the order of 2-6 per cent showed no significant differences between the husk mulched, no husk mulched and square samples.

This is perhaps due to the fact that no prolonged period of drought was experienced prior to the dates of sampling, as shown by the rainfall figures for Ratmalagara given below :—

Rainfall Figures of Ratmalagara Estate

Date	*January*	*February*	*March*
2	0.22	—	—
7	0.72	—	—
8	—	0.41	—
9	—	0.46	—
12	—	0.16	—
20	—	—	0.86

(*b*) *Soil Nitrogen Studies.* In continuation of the work on the soils at Bandirippuwa Estate, already reported, soil samples were taken from the Manurial Cultivation Experiment, at Ratmalagara Estate and analysed for nitrate, ammoniacal and total nitrogen. The figures given in Table II confirm the earlier results, based on soils of Bandirippuwa Estate which indicated that there is a considerable amount of ammoniacal nitrogen present both in the top and sub-soils of coconut lands in contrast to the low concentration of nitrate nitrogen.

TABLE II

Soil Nitrogen Studies—Ratmalagara Estate Soils

Sample No.		*ppm NH_4 Nitrogen*	*ppm NO_3 Nitrogen*	*ppm Total Nitrogen*	*% Clay*	*Total Exchangeable Bases me/ 100 gms.*
Plot 3	S.T.	—	2.5	677	11.1	4.01
	S.S.	14.21	1.4	721	8.5	3.76
Plot 8	S.T.	14.3	1.8	607	4.8	1.71
	S.S.	11.7	1.7	770	5.7	0.98
Plot 14	S.T.	12.9	1.6	670	10.6	0.57
	S.S.	15.5	1.9	497	7.1	0.81
Plot 23	S.T.	13.3	2.6	634	10.1	0.71
	S.S.	9.6	1.5	541	2.4	0.51
Plot 27	S.T.	14.42	1.7	500	4.2	0.81
	S.S.	10.8	1.6	392	7.0	0.69
Plot 35	S.T.	12.6	1.9	507	6.6	0.55
	S.S.	10.2	1.5	429	10.3	2.09

S.T. means—Square Top (0-9″). S.S. means—Square Sub (9-18″).

The clay fraction and total exchangeable bases in these soils were also determined and are given in the above table.

Nitrogen determinations were also carried out on a further set of soil samples from Bandirippuwa Estate taken during a period of dry weather. Here again there is a high concentration of ammonical nitrogen and very low concentration of nitrate nitrogen. The results are given in Table III.

The soil from the Botanist's block is of a sandy texture, and it is seen that in this sandy soil there is a much lower concentration of ammonical nitrogen.

TABLE III

Soil Nitrogen Studies—Bandirippuwa Estate

	Sample No.	*ppm NH_4 Nitrogen*	*ppm NO_3 Nitrogen*	*Total Nitrogen*
Plot 18—	S.Top (0 9″)	12.4	0.6	427
	S.Sub (9-18″)	10.1	0.8	390
	S.Sub (18-30″)	12.7	0.6	336
Plot 2—	S.T.	12.5	0.4	534
	S.S. 1	10.2	0.8	420
	S.S. 2	10.3	0.6	326
Botanist's Block	S.T.	2.2	2.3	281
	S.S. 1	2.2	0.5	205
	S.S. 2	0.0	0.0	124

(c) *Studies on Soil Phosphorus.*

Studies on the fractionation of soil phosphorus were continued on a few soil samples collected in 1944 from the manurial circles of P_0 plots of the N.P.K. Experiment at Bandirippuwa Estate from the manure circles. Table IV compares the fractionation figures for the 1935 and 1951

for the 1944 samples. It is seen that there is a definite
n from 1935 to 1951 (see Annual Report—C.R.I., 1954).

[illegible] were all carried out on the 2 m.m. samples. Fractionations were carried out on the same samples finely ground to pass through 100 mesh seives and the results shown in Table V below again indicate an increase in the total alkali soluble fraction in the period 1935-1951. It is also seen that the 100 mesh sample has released a greater amount of acid soluble phosphate.

TABLE IV

Fractionation of Soil Phosphorus—Summary of Data on 1935, 1944 and 1951 —M.C.T. Samples from N.P.K. Experiment at Bandirippuwa Estate

Plot No.	*ppm Acid Soluble P_2O_5*			*ppm Total Alkali Soluble P_2O_5*			*ppm Inorganic P_2O_5 Alkali Soluble*			*ppm Organic P_2O_5 Alkali Soluble*		
	1935	1944	1951	1935	1944	1951	1935	1944	1951	1935	1944	1951
8	40	35	30	140	280	384	116	138	192	24	142	192
23	25	20	25	140	261	360	104	144	112	36	117	188
45	15	24	25	140	151	300	80	146	104	60	5	196
54	15	30	35	140	265	300	120	216	136	60	49	164

TABLE V

Plot No.	*ppm Acid Soluble P_2O_5*		*ppm Total Alkali Soluble P_2O_5*		*ppm Inorganic P_2O_5 Alkali Soluble*		*ppm Organic P_2O_5 Alkali Soluble*	
	1935	1951	1935	1951	1935	1951	1935	1951
8	177	65	280	366	216	216	64	150
23	136	165	280	375	165	173	115	205
45	177	95	280	270	181	160	124	110
54	157	95	280	310	244	187	116	123

Fractionations were also carried out on some combined soil samples taken from the centres of squares of the N.P.K. plots at Bandirippuwa Estate in 1935 and 1955. In these too an increase of the alkali soluble phosphate fraction is shown in the 1955 samples. These increases are probably due to the fact that there are ample reserves of mineral phosphates in these soils which are being weathered into available forms at a rate faster than the available forms are being removed from the soils.

TABLE VI

Fractionation of Soil Phosphorus—Square Centre Top Samples from N.P.K. Plots Bandirippuwa Estate

Plots Combined	*Sample No.*	*ppm Acid Soluble P_2O_5*		*ppm Total Alkali Soluble P_2O_5*		*ppm Organic P_2O_5 Alkali Soluble*		*ppm Organic P_2O_5 Alkali Soluble*	
		1935	1955	1935	1955	1935	1955	1935	1955
1 + 4 + 7	1	26	—	190	—	138	—	52	—
1 + 14 + 17	5	41	—	182	—	138	—	44	—
1 + 24 + 27	9	27	—	131	—	74	—	57	—
) + 33 + 36	12	28	63	190	212	138	170	52	42
3 + 41 + 44	14	30	80	170	243	166	186	4	57
) + 49 + 52	16	26	20	216	298	160	211	56	87
7 + 50 + 53	17	28	31	195	312	86	202	109	110
3 + 51 + 54	18	38	31	200	312	90	211	110	101

(*d*) *Phosphate Content of Nut Water in Relation to Phosphate availability in the Soil and Response to Phosphate Manuring.*

It has already been shown that potash content of nut water can be used as an index of the potash status of the soil.

The lack of a quick and simple routine method for determining phosphate in nut water has so far stood in the way of investigating the possibilities of similarly using the phosphate content of nut water as an index of the phosphate status and its avialability in the soil.

This difficulty has now been successfully overcome by a modification of the photometric method for determining inorganic phosphate using the phospho-vanado-molybdate complex.

The method can be applied on the fresh nut water : the procedure is very simple and quick, 12 determinations carried out in one hour.

The method as applied to nut water samples from the manurial experiment at Ratmalagara, where the phosphate response is highly significant, and of the N.P.K. experiment at Bandirippuwa where no response is obtained, indicate that the method can be used as an index of phosphate response. 100 mgms. of phosphoric acid per litre appears to be a *critical value* below which response to phosphate manuring can be expected.

(*e*) *Potash Content of Coconut Water :*

N.P.K. Manurial Experiment (Bandirippuwa Estate)

The determination of the potash content of coconut water samples from the N.P.K. manurial experiment at Bandirippuwa Estate, which had been discontinued since 1949 were commenced again in January 1954 in order to study the effect of stepping up the levels of potash applied to the palm since November 1951.

A comparison of the figures for the concentration of potash in nut waters with those of 1947 show that the stepping up of the levels of potash had so far no effect in increasing the uptake of potash by the palm :—

TABLE VII

gms. K_2O per litre Nut Water

Pick	1947			1954			1955		
	K_0	$K_{0.75}$	$K_{1.5}$	$K_{0.75}$	$K_{1.5}$	$K_{2.25}$	$K_{0.75}$	$K_{1.50}$	$K_{2.25}$
1	1.06	1.56	1.95	0.97	1.55	1.93	1.27	1.80	1.99
2	1.08	1.64	2.07	0.98	1.51	1.94	1.29	1.75	1.96
3	0.99	1.47	1.82	1.00	1.55	1.90	1.02	1.56	1.93
4	0.92	1.51	1.90	1.02	1.53	1.92	1.05	1.49	1.80
5	1.06	1.59	1.98	1.06	1.55	1.89	1.11	1.62	2.04
6	1.04	1.59	2.05	1.09	1.61	1.98	1.05	1.48	1.88
Mean	1.03	1.56	1.96	1.02	1.55	1.93	1.13	1.62	1.93

(*f*) *Effect of Manuring on Soil Reaction.*

Determinations of pH values were made on a series of soil samples taken from the manurial circles of the 3 × 3 × 3 N.P.K. Experiment at Bandirippuwa. The soil samples were taken

in 1935 before the first application of manure and subsequently in 1940(series II), 1944 (series III) and 1951 (series V).

The manures were applied in November 1935 and subsequently biennially.

The results are given in Tables VIII and IX. Table VIII gives the pH values for the plots where no nitrogen had been applied and in Table IX the pH values for plots receiving nitrogen are arranged according to the type of nitrogen manure, e.g. Sulphate of Ammonia, Calcium Cyanamide and Ground-nut cake.

There does not appear to be any consistent trend in the effect of manuring on changes in the reaction of the soil.

The possibility of the continuous use of Sulphate of Ammonia increasing the acidity of the soil could only occur where it is used alone, without the addition of Saphos Phosphate, as in plot 3 (Treatment N1P0K1) where the pH drops from 5.43 to 4.70 and Plot 2 (Treatment N2-P0K1) where the pH drops from 5.43 to 4.70 and Plot 2 (Treatment N2P0K2) where the pH drops from 5.25 to 4.40. Where Saphos Phosphate is used both the calcium in the calcium phosphate and the free lime as Calcium Carbonate present in Saphos Phosphate can be expected to neutralise any change in reaction due to the use of sulphate of ammonia, as shown in plots 11 (N1P1) and Plot 14 (N2P1).

TABLE VIII

pH Values—Soil Samples from Manure Circles

3 × 3 × 3—*N.P.K. Experiment (Bandirippuwa)—No Nitrogen Plots*

Treatment	*Plot No.* K_0	K_1	K_2	*Series I*—1935	*Series II*—1940	*Series III*—1944	*Series V*—1951
	8			5.29	5.32	4.94	5.09
	28			6.21	5.43	4.98	5.66
		18		5.21	5.25	5.02	5.18
N_0P_0		39		—	—	4.91	—
			21	—	—	5.53	5.07
			46	5.58	4.97	—	5.13
	26			—	5.33	—	—
	50			5.52	5.41	—	5.61
		1		5.36	5.27	—	5.27
		29		—	—	—	—
N_0P_1			12	4.99	5.46	—	5.18
			41	5.73	5.39	—	5.41
	15			5.02	5.31	—	5.52
	37			5.68	5.45	—	5.52
		27		5.99	5.41	—	5.66
N_0P_2		51		5.63	5.23	—	5.68
			5	5.38	—	—	5.46
			33	—	—	—	—

TABLE IX

pH Values—Soil Samples from Manure Circles

$3 \times 3 \times 3$ *N.P.K. Manurial Experiment (Bandirippuwa)—Nitrogen Plots*

	Plot No.	AMMONIUM SULPHATE				Plot No.	CALCIUM CYANAMIDE				Plot No.	GROUND-NUT CAKE			
Treatments	$K_0K_1K_2$	1935 *Series* I	1940 *Series* II	1944 *Series* III	1951 *Series* V	$K_0K_1K_2$	1935 *Series* I	1940 *Series* II	1944 *Series* III	1951 *Series* V	$K_0K_1K_2$	1935 *Series* I	1940 *Series* II	1944 *Series* III	1951 *Series* V
N_1P_0	3	5.43	5.19	4.53	4.70	20	—	—	5.68	—	13	4.99	5.25	4.80	4.66
	35	—	—	4.79	—	54	5.03	5.31	5.20	5.29	45	6.01	4.97	5.23	5.04
N_1P_1	11	5.08	5.31	—	5.08	9	5.06	5.66	—	5.61	25	—	—	—	—
	43	—	—	—	—	30	—	—	—	—	47	5.38	5.06	—	4.99
N_1P_2	24	—	—	—	—	10	5.12	5.43	—	—	6	5.31	5.19	—	5.32
	52	5.34	4.63	—	5.19	42	—	—	—	—	31	—	—	—	—
N_2P_0	2	5.25	5.19	4.36	4.40	17	6.03	6.96	6.19	5.33	23	6.25	5.23	5.24	4.69
	34	—	—	4.79	—	40	—	—	—	—	48	5.39	5.06	4.63	4.82
N_2P_1	14	4.98	4.96	—	4.82	22	—	—	—	—	4	5.45	5.35	—	4.88
	44	—	—	—	—	49	5.66	7.03	—	6.62	36	5.82	5.39	—	5.67
N_2P_2	19	5.20	4.99	—	5.07	7	5.33	—	—	5.78	16	5.11	5.19	—	5.23
	53	5.22	4.33	—	4.86	32	6.62	6.13	—	6.46	38	—	—	—	—

(*g*) *Observation Trial on Nut-fall (Kobeigane).*

In connection with the observation trial on nut-fall at Kobeigane it was observed that both the ground waters (well) and surface waters (pond) were very saline. Besides chlorides, the well waters contained calcium and magnesium in fair amounts. The salt concentration as gms. NaCl per litre are given below :—

	gms. NaCl/litre
Well water	0.85
Pond	0.81

Mechanical analysis and pH determinations on soil samples taken up to a depth of 102" were made. The soil was found to be a sandy loam up to a depth of 30 inches, overlying a clay pan. The deeper layers were definitely calcareous.

1. **pH of the Soil**

Depth	*pH*
0- 9"	5.88
9- 18"	5·75
18- 30"	5·45
30- 42"	5·55
42- 54"	6.55
54- 66"	8.43
66- 78"	8.56
78- 90"	8.56
90-102"	8.63

NOTE—In the last four layers of the soil presence of carbonate was detected.

2. **Mechanical Analysis**

Soil Depth	*C. Sand*	*Fine Sand*	*Silt*	*Clay*
0- 9"	71.42	17.60	1.8	8.7
9- 18"	70.85	16.88	1.8	8.8
18- 30"	81.13	2.06	12.4	8.4
30- 42"	78.30	7.38	2.6	14.2
42- 54"	60.05	7.44	8.5	22.0
54- 66"	46.33	19.12	10.3	24.2
66- 78"	71.90	6.11	5.2	18.3
78- 90"	55.08	23.33	6.0	15.7
90-102"	62.17	12.84	9.4	17.1

(*h*) *Soil Surveys.*

Soil surveys of Crown Jungles in the following areas were carried out during the year for purposes of land development with coconuts as the main crop :—

Province	*District*	*Location*	*Suitable acreage*
Northern	Mullaitivu	Alampil	5,000
		Vattapalai	4,500
		Kokkuthoduai	1,500
		Ampalavanpokkanai, W.	1,000
		Puthukudirippu	6,800
Southern	Hambantota	Gonadeniya	none
N.W.P.	Puttalam	Mahauswewa	400
		Karaitivu	1,000
		South of Vamativillu Karaitivu Road	3,500
Uva Province	Bibile	Bakinigaswewa	250
	Wellawaya	Veherayayakelle	1,000
N.W.P.	Wanni Hatpattu	Kadigawa	750
		Unagalla	600
		Total ..	26,300

Of the areas surveyed Mullaitivu appears to be the most promising for extensive development under coconuts.

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REPORT OF THE CHEMIST

1. *Experiments on the 'Generator' Process for the Manufacture of Coconut Toddy Vinegar.*

In continuation of the work reported in 1954, 26 more charges of fermented toddy (vinegar stock) were put through the experimental generator quantitatively.

The complete analytical data now available on 50 charges are summarised in Table I below :—

TABLE 1

Analytical data on Charges 2 to 51 (Summarised Results)
(Composition of Samples before and after passing through Generator)

	COMPOSITION OF TODDY USED			*COMPOSITION OF VINEGAR PRODUCED*			
Charge No.	*% Total Acidity (as acetic) gms/100 ml.*	*% Alcohol V/V*	*% Total Solid gms/100 ml.*	*% Total Acidity (as acetic) gms/100 ml.*	*% Alcohol V/V*	*% Total Solids gms/100 ml.*	*No. of hours taken for complete acetification*
2	1.85	5.9	2.74	3.82	1.6	2.57	—
3	1.75	6.7	3.22	6.24	0.0	3.23	168
4	1.88	6.9	3.26	5.86	0.0	3.07	144
5	1.31	7.7	2.93	6.91	0.0	3.24	120
6	1.27	7.4	2.76	7.42	0.0	3.18	144
7	1.52	8.0	3.18	7.29	0.0	3.31	144
8	3.64	5.0	3.06	7.70	0.0	3.28	120
9	1.68	7.7	2.18	7.54	0.0	2.70	144
10	2.50	5.8	2.55	7.32	0.0	2.70	144
11	4.06	3.5	0.98	7.37	0.0	2.19	72
12	2.16	7.2	2.42	7.38	0.0	2.62	144
13	1.84	6.1	2.58	7.36	0.0	2.36	144
14	1.96	6.4	2.74	7.42	0.0	2.46	168
15	1.96	6.4	2.64	7.45	0.0	2.54	144
16	1.81	6.6	2.75	7.42	0.0	2.68	144
17	2.03	6.6	2.20	7.59	0.0	2.40	144
18	2.15	6.5	2.21	7.30	0.0	2.61	144
19	2.01	6.6	2.37	7.44	0.0	2.64	144
20	2.50	6.1	2.39	7.46	0.0	2.61	144
21	1.22	7.4	2.82	7.40	0.0	2.70	168
22	2.24	6.0	2.52	7.46	0.0	2.66	144
23	3.34	4.4	2.36	7.39	0.0	2.57	120
24	3.78	4.0	2.43	7.50	0.0	2.82	144
25	2.38	6.6	2.35	7.52	0.0	2.61	144
26	2.93	6.4	2.62	7.84	0.0	3.20	144
27	2.90	6.1	2.93	7.46	0.0	2.83	141
28	3.72	4.7	2.97	7.29	0.0	2.79	120
29	4.30	3.6	2.21	7.62	0.0	2.36	144
30	3.29	5.1	2.21	7.14	0.0	2.26	168
31	3.33	5.0	2.04	7.83	0.0	2.22	144

TABLE 1—(*Contd.*)

Analytical data on Charges 2 to 51 (Summarised Results)
(Composition of Samples before and after passing through Generator)

	COMPOSITION OF TODDY USED			*COMPOSITION OF VINEGAR PRODUCED*			
Charge No.	*% Total Acidity (as acetic) gms/100 ml.*	*% Alcohol V/V*	*% Total Solid gms/100 ml.*	*% Total Acidity (as acetic) gms/100 ml.*	*% Alcohol. V/V*	*% Total Solids gms/100 ml.*	*No. of hours taken for complete acetification*
32	4.02	4.4	2.17	7.32	0.0	2.27	96
33	5.32	1.8	2.12	7.14	0.0	2.10	72
34	4.78	3.8	2.06	6.99	0.0	2.15	144
35	3.36	5.2	2.06	6.86	0.0	2.16	192
36	4.34	3.7	2.11	7.04	0.0	2.14	144
37	4.92	3.4	2.04	7.11	0.0	2.10	144
38	3.66	4.8	2.19	7.23	0.0	2.27	144
39	3.68	4.7	2.10	7.57	0.0	2.25	96
40	2.25	6.4	2.38	7.45	0.0	2.63	120
41	4.01	4.2	2.59	7.46	0.0	2.58	120
42	2.08	6.6	2.29	7.37	0.0	2.62	144
43	1.90	6.3	2.66	7.39	0.0	2.41	168
44	1.39	7.7	2.97	7.36	0.0	3.24	144
45	2.48	6.0	2.54	7.35	0.0	2.71	120
46	2.20	6.1	2.50	7.41	0.0	2.65	144
47	1.55	7.8	3.20	7.26	0.0	3.35	144
48	2.08	7.4	2.40	7.29	0.0	2.66	144
49	1.25	7.3	2.85	7.38	0.0	2.68	168
50	1.65	7.8	2.20	7.46	0.0	2.65	144
51	2.95	6.3	2.58	7.62	0.0	3.15	144
Average	2.66	5.9	2.49	7.26	0.0	2.64	144 (*nearest 24 hours.*)
Range	1.22 to 5.32	1.8 to 8.0	0.98 to 3.26	3.82 to 7.84	0.0 to 1.6	2.10 to 3.35	72 to 192

With the exception of seven charges all the samples when taken to complete acetification had acidities over 7 per cent ranging between 7.04 and 7.84. The overall average acidity on the 50 charges was 7.26 per cent. Based on the data obtained in these experiments the following observations have been made :—

(*a*) Acetification of toddy can be taken to completion on an average within 144 hours (6 days) using the ' generator ' process.

(*b*) The finished vinegar could be expected to have an acidity of over 7 per cent.

(*c*) The overall recovery of acid is about 85 per cent of the theoretical which may be taken as a measure of the efficiency of the ' generator ' process.

In comparison the recovery of acid in the ' Vat ' process rarely exceeds 50 per cent of the theoretical.

(*d*) All samples of vinegar made from the 50 charges were uniformly good in quality.

2. *Commercial Vinegar Generators.*

Two vinegar makers who constructed pilot plant 'Generators' of 50 and 150 gallon capacities (prior to going into commercial production) carried out trials during the early part of the year with very promising results.

The 50 gallon generator was found to give vinegar of over 5 per cent strength consistently and the other manufacturer used the larger generator for making 4,000 gallons of vinegar with an overall acidity of 4.77 per cent. This could be regarded as satisfactory, considering the fact that the acetifying toddy used was only of fair quality being a blend of good and poor samples; some of the fermented toddy put through being even contaminated with rain water.

3. *Vinegar from Fermented Sweet Toddy.*

An interesting observation was made that sweet toddy (using 'Hal' bark as a retarder of fermentation) if allowed to ferment under laboratory conditions, could yield a fermented liquor higher in alcohol content than ordinary fermented toddy.

Under the usual conditions of tapping and collecting for fermented toddy about 1 to 1.5 per cent of alcohol is lost due to injudicious handling. In the case of Sweet Toddy however where fermentation sets in only after it is received in the laboratory this 1—1.5 per cent of alcohol is conserved, as there are no chances of loss.

It was found that after fermentation and settling for a few weeks the liquor from sweet toddy had a pleasing light golden yellow colour and appealing aroma reminiscent of the bouquet of esters in distilled liquors.

These observations presented the possibility of making a strong vinegar of highly aromatic flavour from fermented sweet toddy. Accordingly ten samples of fermented and settled sweet toddy in various stages of acetification were put quantitatively through the laboratory generator. All ten samples chosen had an initial (acid + alcohol) strength over 9.0 per cent. The results of this experiment are summarised in Table II below :—

TABLE II

(Analytical data on Vinegar from Sweet Toddy)

Composition of Samples before and after passing through Generator.

Charge No.	*Composition of Fermented Sweet Toddy used*				*Composition of Vinegar Produced*			*No. of hours taken for complete acetification*
	% Total Acidity (as acetic) gms/100 ml.	*% Alcohol V/V*	*% Acidity plus Alcohol*	*% Total Solids gms/100 ml.*	*% Total Acidity (as acetic) gms/100 ml.*	*% Alcohol V/V*	*% Total Solids gms/100 ml.*	
1	1.24	7.8	9.04	2.14	8.05	0.0	2.36	192
2	0.78	8.5	9.28	2.21	8.33	0.0	2.50	192
3	0.34	9.3	9.64	2.04	8.44	0.0	2.26	168
4	2.89	6.4	9.29	1.68	8.29	0.0	2.13	168
5	2.72	6.5	9.22	1.94	8.10	0.0	1.81	168
6	0.56	9.6	10.16	1.18	8.73	0.0	1.82	168
7	0.95	8.3	9.25	1.89	8.34	0.0	1.89	168
8	1.48	7.7	9.18	1.85	8.17	0.0	1.93	168
9	0.53	9.4	9.93	1.22	8.65	0.0	1.66	144
10	1.85	7.3	9.15	1.19	8.14	0.0	1.26	144
Average	1.33	8.1	9.43	1.73	8.32	0.0	1.96	168
Range	0.34 to 2.89	6.4 to 9.6	9.04 to 10.16	1.18 to 2.21	8.05 to 8.73	0.0	1.26 to 2.50	144 to 192

It will be seen that, as expected, all ten samples of vinegar when taken to complete acetification have acid strengths over 8 per cent.

The overall average acidity of 8.32 per cent is one per cent higher than the corresponding figure of 7.26 per cent (for 50 samples) for vinegar prepared from ordinary fermented toddy. The average time taken for complete acetification however is 168 hours which is 24 hours longer than that taken for ordinary toddy. As against 85 per cent for ordinary toddy the overall recovery of acid for sweet toddy calculated from the above figures, is 88.2 per cent of the theoretical. The present results therefore give further support to the previous observations regarding the very much higher efficiency of the 'Generator' process in comparison with the 'Vat' process.

Based on visual and analytical characteristics the finished vinegar from these ten experimental charges of fermented sweet toddy may be stated to be good. In appearance they were clearer and of a better colour than ordinary toddy vinegar and were definitely more aromatic.

4. *Experiments on the Maturation of Vinegar.*

(*a*) Fifty gallons of vinegar prepared from fermented *toddy* using the laboratory generator have been stored in a 'halmilla' cask kept nearly full. The toddy used for this experiment was not taken to complete acetification in order to facilitate the production of esters and other aromatic constituents. The composition of the bulked 50 gallons of vinegar on 31st December, 1955 was as follows :—

Acidity (as acetic)	.. ..	6.34 per cent
Alcohol V/V	.. ..	1.8 „ „
Total Solids	.. ..	2.52 „ „

The vinegar was of a pale straw colour with an agreeable acetic odour and sharp but palatable acid taste. A haze however was perceptible.

(*b*) Twenty-five gallons of vinegar prepared from fermented *sweet toddy* using the laboratory generator were similarly stored in a halmilla cask. In this case too the acetification was not taken to completion. The composition of the bulked 25 gallons of vinegar on 31st December, 1955 was as follows :—

Acidity (as acetic)	.. ..	7.27 per cent
Alcohol V/V	.. ..	1.4 „ „
Total Solids	.. ..	2.02 „ „

The vinegar was of a pale golden yellow colour with an agreeable acetic odour blended with esters, and sharp but palatable acid taste. The bulked sample was fairly but not brilliantly clear.

5. *Studies on the Fermentation of Toddy and Sweet Toddy.*

The data quoted above indicate the possibility regarding higher alcohol recoveries from sweet toddy in comparison with toddy.

This interesting observation is being pursued with the idea of getting full quantitative data on the fermentation of coconut sap when collected and fermented under different conditions. The complete results will be reported later at the termination of the investigations.

6. *Sand Culture Experiment.*

Using 12 giant size concrete cylinders as sand culture vessels an experiment is being started to grow coconut seedlings hydroponically under controlled conditions of mineral

nutrition. As the cinnamon sand used in these studies is an inert aggregate the nutrients (both ' macro ' and ' micro ') will be supplied in the form of pure chemicals. Studies will be made on the visual and analytical characteristics of the vegetative parts associated with specific and multiple nutrient element deficiencies.

It is proposed to plant 12 seedlings *without* husks in the pots and treat them differently as follows :—

Seedling No.	*Treatment (Nutrients supplied)*	*Deficiencies (Nutrients not supplied)*	*Remarks*
1.	No mineral nutrients (minus ALL)	N,P,K,S,Ca,Mg & T.E. (minus ALL)	Only mineral reserves in shell, kernel and apple of seedling. Water only supplied.
2.	N,P,K,S & T.E.	Ca & Mg.	
3.	N,P,K,S,Ca & Mg.	T.E.	
4.	N,P,K,S,Ca,Mg & T.E. (plus ALL)	None (plus ALL)	Micro-nutrients supplied in the form of Pure Chemicals.
5.	N,P,K & S	Ca,Mg & T.E.	
6.	P,K,S,Ca,Mg & T.E.	Nitrogen	
7.	N,K,S,Ca,Mg & T.E.	Phosphorus	
8.	N,P,S,Ca,Mg & T.E.	Potassium	
9.	Ca,Mg,S & T.E.	N,P & K.	
10.	N,P,K,S,Mg & T.E.	Calcium	
11.	N,P,K,S,Ca & T.E.	Magnesium	
12.	N,P,K,S,Ca,Mg & F.T.E. (plus ALL)	None (plus ALL)	Micro-nutrients supplied in the form of *F.T.E.* (Fritted Trace Elements.)

N — Nitrogen
P — Phosphorus
K — Potassium
S — Sulphur
Ca — Calcium
Mg — Magnesium
T.E. —Micro-nutrients
F.T.E. —Fritted Trace Elements.

A preliminary experiment carried out in the Botanists' nursery has already shown that *husked coconuts* can be made to germinate and grow without impairment of vigour. It is therefore deemed expedient to select the 12 seedlings for this experiment from seed-nuts germinated in this fashion, in order to minimise complications resulting from reserves of mineral nutrients in the various components of the coconut.

7. Relationship between Moisture Content of Copra and Atmospheric Humidity.

The results of analyses of a large number of copra samples in this laboratory during the past 25 years show that the moisture content of Ceylon estate copra can range between 4:0

and 9.4 per cent. The lowest moisture content recorded for any sample so far received is 3.7 per cent, on a sample of No. 3, copra prepared from rejected coconut seedlings. The above wide range in moisture content though it mostly reflects the efficiency of the drying operations yet it can (depending on conditions of storage) be contingent on temperature and humidity relationships of the atmosphere.

It is generally understood that the moisture content of edible white copra in Ceylon should be below 6.0 per cent whereas ordinary estate copra could have moisture contents ranging between 6.0 and 8.0 per cent. It would thus be evident that more nuts of the same size will be required to produce a candy (560 lbs.) of edible white copra than the same weight of estate copra because of these moisture specifications.

It is also well known that copra that has once been dried in conformity with these moisture requirements does increase or decrease in weight (depending on conditions of storage) purely in reaction to changes in atmospheric humidity. As the humidity of the atmosphere itself changes with the air temperature, the tendency for these moisture fluctuations in copra becomes all the more evident.

With these facts in mind, a simple laboratory experiment has been started to study the changes in the moisture content of copra under different humidities at the mean temperature for this station 80.8°F.

Using sulphuric acid of strengths ranging from 20 to 100 per cent (W/V) in vacuum desiccators it has been found possible to get humidities ranging from 1.5 to 100 per cent. A Lufft hair-hygrometer calibrated from 20 to 100 per cent on the humidity scale and 20 to 110°F on the temperature scale was employed for registering the humidities in the desiccator chambers.

For each strength of acid used viz. 20, 30, 40, 50, 60, 70, 80 and 90 per cent W/V sulphuric acid humidity and temperature readings were taken at hourly intervals from 7-00 a.m. to 10-00 p.m. Where this range of readings did not cover the mean temperature for the station, further readings were taken at other times of the day till it was possible to record the humidity at 80.8°F.

Expressed graphically, by plotting the acid strengths along the horizontal axis and the corresponding humidity readings along the vertical axis it was found that five out of the eight points fell on a straight line indicating linear relationship. At humidities below 50 per cent the hygrometer did not appear to register accurately. The readings used for producing this graph are charted in Table III below :—

TABLE III

% Humidity corresponding to various acid strengths at 80.8°F (27.1°C)

Strength of acid % H_2SO_4 (gms./100 ml.)	20	30	40	50	60	70	80	90	100
% Relative Humidity (Actual Readings)	100.0	88.8	75.5	63.2	50.5	40.5	28.5	20.0	1.5 (by extra-polation)
% Relative Humidity (Calculated from averages for 16 Readings)	98.7	88.1	75.2	63.3	51.3	41.7	30.4	20.5	-

With the aid of this graph and using vacuum desiccators (containing sulphuric acid of different strengths) quantitative studies have been commenced to observe the variations in moisture content of copra when stored under varying conditions of humidity at the mean temperature for this station. Further results on this experiment will be reported later.

8. *Examination of Hybrid Palm Copra.*

Eleven samples of hybrid palm copra sent by the Botanist during the year were examined for moisture and oil content. The results are tabulated in Table IV below :—

TABLE IV

(Analytical Data on Hybrid Palm Copra)

Palm No.	*No. of Cups*	*Wt. of Copra (gms.)*	*% Moisture*	*% OIL*	
				Wet Basis	*Dry Basis*
112	32	3,516	7.00	63.69	68.48
114	24	2,666	6.55	65.83	70.44
122	24	3,034	6.81	64.21	68.90
146	38	3,573	7.01	62.70	67.42
148	24	2,694	7.37	64.65	69.79
85	19	1,474	5.61	61.85	65.50
104	55	6,181	6.24	62.94	67.14
110	30	3,686	6.57	62.18	66.45
111	42	5,359	5.69	62.49	66.26
113	46	6,152	5.56	60.04	63.27
134	20	2,524	5.59	62.92	65.85
Aver : 11 Samples	32	3,714	6.36	63.05	67.23
Range	19 to 55	1,474 to 6,181	5.56 to 7.37	60.04 to 65.83	63.27 to 70.44

It is interesting to note that two of the samples of copra (from palms 114 and 148) have registered reasonably high oil contents of 70.4 per cent and 69.8 per cent respectively, calculated on the moisture free basis.

9. *Examination of Farmyard Manure.*

The analysis of a half yearly sample of Farmyard manure drawn in June 1955, was done during the year. Unlike on previous occasions, the animals were all fed on a mixed diet

of pasture and concentrates. Consequently it was possible to prepare only one sample of manure, which has been analysed with the following results :—

Farmyard Manure from Cattle fed on Mixed Diet (Pasture and Concentrates)

Date of Sampling	*% Moisture*	*% Nitrogen (as N)*		*% Phos: Acid (As P_2O_5)*		*% Potash (as K_2O)*	
		Wet Basis	*Dry Basis*	*Wet Basis*	*Dry Basis*	*Wet Basis*	*Dry Basis*
30-6-55	1.43	0.72	0.73	0.33	0.34	1.11	1.12

The concentrations of all the manurial constituents in this sample are lower than the average values found on the previous lots prepared from (*a*) pasture fed and (*b*) concentrate fed animals.

It is proposed to continue these analyses at half yearly intervals as before.

10. *Coir Dust as Mulch.*

The immature nut-fall recorded (at 10 day intervals) during the year on the Coir Dust observation plot was compared with corresponding records kept on the control and overgrazed plots as usual. The summarised data for the four quarters are given in Table V, differentiating between large, medium and small nuts.

TABLE V

(Immature Nut-fall recorded during 1955)

Quarter	*Size*	*Coir Plot*	*Control Plot*	*Overgrazed Plot*	*Rainfall (Inches)*
First	Large	28	25	24	
,,	Medium	28	21	23	6.13
,,	Small	71	77	72	
Total First Quarter		127	123	119	
Second	Large	15	13	26	
	Medium	23	25	16	34.36
	Small	110	102	113	
Total 2nd Quarter		148	140	155	
Third	Large	28	25	28	
	Medium	28	33	33	17.94
	Small	141	135	120	
Total Third Quarter		197	193	181	
Fourth	Large	71	64	43	
	Medium	100	85	54	24.98
	Small	242	202	127	
Total Fourth Quarter		413	351	224	
Total for the year	Large	142	127	121	
	Medium	179	164	126	83.41
	Small	564	516	432	
General Total	1955	885	807	679	

The general annual immature nut-fall totals for the three plots since the commencement of the experiment are summarised in Table VI. The percentage decrease (or increase) in nut-fall for each year in relation to the 1951 figures in also worked out in the table.

TABLE VI

(General Annual Immature Nut-fall Totals—Period 1951 to 1955)

Year	*COIR PLOT*		*CONTROL PLOT*		*OVERGRAZED PLOT*		*Rainfall (inches)*
	Total fall in nuts	*Decrease (or increase) as % of 1951 fall*	*Total fall in nuts*	*Decrease (or increase) as % of 1951 fall*	*Total fall in nuts*	*Decrease (or increase) as % of 1951 fall*	
1951	976	—	931	—	919	—	94.09
1952	719	—26.3	605	—35.0	472	—48.6	62.40
1953	578	—40.8	536	—42.4	670	—27.1	88.30
1954	464	—52.5	423	—54.6	706	—23.2	93.70
1955	885	—9.3	807	—13.3	679	—26.1	83.41

It will be observed that the nut-falls in all three plots have always been lower than the 1951 figures. The Coir and control plots which were steadily showing decreases by the year, have shown a sharp rise in immature nut-fall during 1955. There are no indications till now to show that the coir mulch by itself has any favourable effects in checking immature nut-fall.

11. *Empirical Field Trials.*

The following empirical field trials were laid down during the year :—

(*a*) ' Trace Element ' experiment on 180 newly planted seedlings at Andigama Estate, Giriulla in order to ascertain whether the essential micro-nutrients supplied in the form of F.T.E. (Fritted Trace Elements) would prove beneficial to their growth and future performance.

(*b*) On 48 yellowing palms at Maliduakande Group, Henegama, Gampaha to ascertain whether the symptoms were linked up with the major nutrients calcium and magnesium and the ' trace ' element Boron.

(*c*) On 48 young palms in the Planting Officers Demonstration Plot at Ratmalagara Research Station to ascertain whether the application of Boron (singly) or in combination with Calcium and Magnesium (in the form of Dolomite) would prove beneficial to their growth and future performance.

(*d*) On 6 Yellowing palms at ' Walterland ' Estate, Horana to ascertain whether the inducement of new root production by the building of (14' × 14' × 3') platform bunds using fertile top soil and artificial fertilisers would give a new lease of life to yellowing and tapering palms.

12. *Miscellaneous Work.*

(*a*) Four samples of coconut oil sent by a miller for bleaching and deodorizing trials were treated with Fullers Earth, Kieselguhr and Animal Charcoal in the manner

recommended by him for trial. Except for slight improvement in odour in certain samples, the results were negative.

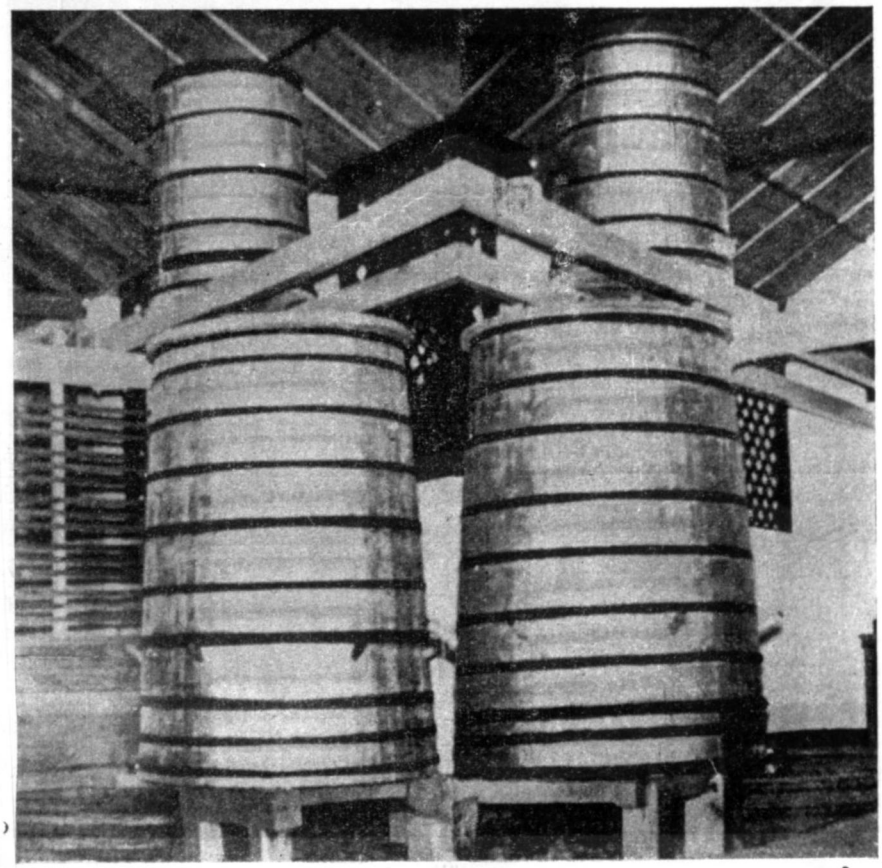
(*b*) A sample of rice bran ash sent by an estate Superintendent was analysed for the major manurial constituents. The potash content of the ash was low (0.44 per cent, dry basis), but it contained 2.6 per cent of phosphorus (calculated as P_2O_5). There was only a trace of organic nitrogen, and the sample was found to be grossly contaminated with sand.

(*c*) Two samples of a new brand of coconut vinegar were analysed and duly reported on. The samples were fair as regards quality with a mean acidity of 5.32 per cent and a residual alcohol content of 0.59 per cent V/V. The presence of mycodermal growth and other suspended impurities in one sample was however not a desirable feature. The second sample showed a decided improvement in this respect.

(*d*) Four samples of edible white copra sent by a mill owner and stated to be dried in a special type of kiln were examined for moisture. All four samples had moisture contents above 6 per cent and consequently were reported to be inadequately dried to conform to the moisture specification of this grade.

(*e*) Analytical reports were made on one sample of coconut oil, one sample of expeller poonac, two samples of sediment poonac and a sample of copra, sent by mill owners seeking advice.

W. R. N. NATHANAEL,
Chemist.



REPORT OF THE BOTANIST

1. The Dwarf Palm.

The dwarf palm is a distinct variety of coconuts and a few unsuccessful attempts particularly in Malaya, have been made to establish this variety on a plantation scale. Between 1939 and 1942, a block of nearly 10½ acres at Ratmalagara Estate was planted with Malayan dwarf seedlings to study their toddy yields and productivity of nuts and copra—vide Annual Report for 1940, page 6.

The Chemist carried out tapping trials in 1951 on 24 of these palms and his main conclusion was that, ' the Malayan dwarf coconut palm is not of much value for tapping purposes '. The yield of toddy was 494 c.c. per palm per day or 49,390 c.c. per acre of dwarf palms whereas from the tall variety of palms, the relative figures were 946 c.c. per palm per day or 61,490 c.c. per acre per day—vide Annual Report for 1951, page 15.

The dwarf palm is early flowering and short in habit. The early flowering character has already been referred to in the Annual Reports for 1942 and 1943. The internodal length, i.e. the distance between two leaf scars is short and consequently the palm is short in habit.

Field observations have indicated that these palms are adversely affected during periods of drought ; drooping of leaves and bunches were unusually heavy and nut size was considerably reduced. The palms were generally less hardier than the tall variety palms and the incidence of Rhinoceros beetle (*Oryctes rhinoceros L.*) and Red Weevil (*Rhyncophorus ferrugineus L.*) damage was high.

The palms exhibit periodicity in bearing nuts, i.e. in alternate years the yield of nuts per palm is very low (Table 1). This periodicity is associated with a resting period in production of inflorescences ; after 10 to 14 inflorescences have been produced, the palm rests for 6 to 8 months, and consequently the yield during the corresponding year is low.

TABLE 1.

The yield of the dwarf palm.

Year	*Variety*	*Nuts per acre*	*Copra per acre (cwts.)*	*Nuts per candy of copra*
1951	Dwarf	1,456	2.54	2,860
	Typica	2,546	9.84	1,293
1952	Dwarf	6,458	11.23	2,875
	Typica	2,744	12.56	1,092
1953	Dwarf	2,633	6.75	1,948
	Typica	2,724	11.75	1,158
1954	Dwarf	8,302	16.87	2,459
	Typica	3,762	18.88	996
Average per year (1951-54)	Dwarf	4,712	9.35	2,536
	Typica	2,944	13.26	1,135

The comparative data of the *typica* variety palms, i.e. the tall variety grown commercially, given in Table 1 is from a block planted in 1939, adjacent to the dwarf palm block with the same soil conditions. The *typica* palms have not attained their maximum yield yet, although the dwarf palms are in their prime of life. If the averages given in the last row of Table 1 are considered, it is seen that although the dwarf palms have given 60.1 per cent more nuts per acre than the *typica* palms, the nut size is so small that yield of copra per acre is 29.5 per cent less than from the *typica* palms.

The high out-turn figures considerably increase the cost of production of copra. Further about 20 to 25 per cent of dwarf copra is leathery and can be marketed only as grade 2. Consequently, the dwarf palm is much inferior to the *typica* palm grown on a plantation scale in Ceylon in relation to production of copra per acre and the quality of copra.

In our plantation, four forms of palms can be distinguished : three colour forms of the dwarf type—ivory yellow, golden yellow and green—and a semi-tall type. The golden-yellow and ivory-yellow forms have given larger nuts than the green form, but yet smaller than the *typica* nuts. The semi-tall form is suspected to be a natural hybrid of dwarf × *typica* and can be easily picked out from the dwarf palms as they have broader stems, longer internodes and larger nuts than the dwarfs. Further they show no periodicity in bearing.

Although the dwarf palms have two advantageous characters of short habit and early flowering, the palms are very susceptible to drought, pests and diseases and the yield of good copra per acre is low, that they cannot be recommended as a plantation crop in areas with similar soil and climatic conditions as at Ratmalagara, i.e. lateritic gravel without a good distribution of rain-fall. Even over more wet areas with a loamy soil of average fertility, our observations are that the dwarf palm would not do well as a plantation crop owing to the periodicity in bearing and the small size of the nut.

2. The Seed Garden.

The first programme on controlled pollination covers the establishment of an isolated seed garden for coconuts. The seed garden situated within the Ambakelle forest reserve in the Chilaw district was formally inaugurated on 23rd April, 1955 by the Minister for Agriculture and Food by planting a seed-nut. Since then, considerable developmental work involved in opening jungle land has been in progress. 245 selected seedlings derived by crossing high-yielding palms were planted in December 1955. Further 3,503 hand pollinated nuts were harvested and pollinations were done on nearly 16,500 female flowers out of which about 30 per cent are expected to develop. It is proposed to plant at least 25 acres a year from 1956 onwards.

3. Intra-specific Hybrids.

In the second programme of controlled pollination, crosses between certain varieties of coconut palms are being studied. The main purpose of this work is three fold, *viz.* (*a*) study the genetical behaviour of certain characters of the parental types (*b*) study the expression of hybrid vigour in the first generation (F_1) palms and (*c*) select and develop an improved strain of palms suitable for economic exploitation.

The varieties and forms that have been used are :—

Ceylon *typica*, tall in habit, late flowering, cross fertilized, nuts medium sized, about 0.5 lbs. of copra per nut, grown on a plantation scale in Ceylon ; *San Ramon*, tall in habit,

late flowering, cross fertilized, nuts large, about 0.8 lbs. copra per nut, indigenous to the Phillipine Islands; *Dwarf* (nana), short in habit, early flowering, self-fertilized, nuts small, about 0.2 lbs. of copra per nut; *King-coconut*, semi-tall, late flowering, self-fertilized, nuts medium, endosperm thin; *Natural hybrid*, semi-tall palms suspected to be hybrids of dwarf × *typica* found growing in dwarf palm populations.

Summarized data of some of the hybrid progenies were presented in the Annual Report for 1954. A very promising cross appears to be Ceylon *typica* × dwarf.

Typica × *Dwarf*. The first generation palms (F_1) are early flowering and exhibit hybrid vigour in leaf production and stem formation. Measurements of vegetative characters taken at the end of the 4th year after transplantation are given in Table 2. Leaf production was highest in the F_1 progenies and the differences with either of the parental types were significant at 5 per cent level.

TABLE 2.

Mean leaf number and girth of stem per palm.

	Typica	F_1 *of Typica* × *Dwarf*	*Dwarf*
No. of leaves produced during the fourth year	11.7 ± 2.21	15.8 ± 0.83	13.4 ± 1.49
Girth of stem (in ft.) measured 6 ins. above ground	4.8 ± 0.50	5.4 ± 0.25	2.8 ± 0.35

Dwarf palms have narrow stems, *typica* palms have broad stems and the F_1 progenies between them have broad stems being nearly twice the girth of the former and similar to the latter type. The differences in girth of stem between the F_1 palms and dwarfs are highly significant ($P = 0.01$) but that between the F_1 and typica palms are not significant.

The flowering-age of the first generation palms and of the parental types are given in Table 3. The dwarf variety is early flowering with a mean of 38.0 months, *typica* is late flowering with a mean of 74.3 months and the F_1 palms are early flowering with a mean of 48.6 months. The periods given above and in Table 3 are from the date of sprouting of seed-nut to the date of emergence of the first spathe of the palm.

TABLE 3.

Frequency distribution of flowering age of palms.

Frequency (months)	*Dwarf variety*	*Typica variety*	F_1 *of Typica* × *Dwarf**
31 – 36	10	—	—
37 – 42	4	—	1
43 – 48	1	—	13
49 – 54	1	1	4
55 – 60	1	—	3
61 – 66	—	3	1
67 – 72	—	3	—
73 – 78	—	1	—
79 – 84	—	5	—
85 – 90	—	3	—
Total	17	16	22
Average (months)	38.0	74.3	48.6

(* One palm not in flower at the end of the 5th year.)

Within the first four years, 88 per cent of the dwarf palms and 61 per cent of the F_1 hybrids were in flower against none from the *typica* variety.

In the first generation progenies of *typica* × *dwarf*, the out-breeding system of the former parent is completely dominant; the female flowers are receptive only a day or two after the male flowers have fallen. However, due to extra vigour of these progenies in leaf production, inflorescences are produced at shorter intervals so that selfing can occur due to overlapping of the female phase of the older open inflorescence and the male phase of the younger open inflorescence.

Most of the palms flowered in the latter half of 1954 and not more than 4 to 6 bunches were harvested in the year under review. Consequently, it is premature to consider the yield of nuts and copra at this stage. However, some useful data have been collected from 448 nuts harvested in 1955 and they are given below.

Mean weight per husked nut	1.62 lbs.
Number of nuts required for a ton of copra	4,320
Percentage of No. 2 and 3 copra ..	8.3
Mean oil per cent on a dry basis ..	67.1

Thus the first generation palms between Ceylon *typica* × *dwarf*, appear to be a promising strain in that they are vigorous and early flowering, bearing nuts of good size.

Further inter-varietal crosses were done during the year and a summary is given in Table 4. Whenever San Ramon palms have been used as the female parent, setting of female flowers has been very low, but with the same variety as the pollen parent setting has been good.

TABLE 4.

Inter-varietal crosses done in 1955 at Bandirippuwa.

Cross	*No. of inflorescences*	*No. of female flowers pollinated*	*Per cent setting*
Dwarf × San Ramon	13	170	51.7
San Ramon × Dwarf	8	101	14.8
King Coconut × San Ramon	19	300	44.3
San Ramon × King Coconut	11	131	30.5
Ceylon Typica × King Coconut	16	179	35.1
King Coconut × Ceylon Typica	18	163	47.8
Ceylon Typica × San Ramon	15	273	42.1
San Ramon × Ceylon Typica	7	111	14.4
Ceylon Typica × Natural hybrid	7	89	51.6
Natural hybrid × Ceylon Typica	5	94	53.1

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The same parents have been used in the reciprocal crosses and it is hoped to collect more precise data from the first generation palms in relation to the direction of the crosses.

4. Seed-Hole.

A new field experiment was initiated during the year to study relationships if any, between the size of the seed-hole and growth of coconut seedlings. Four sizes of seed-holes have been tried out as follows :—(*a*) 1 × 1 × 1 feet (1 cu. ft.), (*b*) 3 × 3 × 3 feet (27 cu. ft.), (*c*) cruciform (54 cu. ft.) and (*d*) post-hole borer type (12 cu. ft.).

The cruciform seed-holes were of two trenches 6 feet long, 3 feet broad and 1½ feet deep, placed at right angles in the form of a cross and the central portion common to both trenches deepened to 3 feet. In the post-hole borer type, 5 holes were made with an augur 12 inch in diameter and 3 feet deep; four of them were at the corners of a square 3 × 3 feet and the fifth at the centre of the square in which the seedling was planted.

Each seed-hole was filled with top soil to a depth of 9 inches and selected seedlings were planted in November 1955. The design of the experiment is simple randomisation with 9 plants per plot and 6 replications.

5. Miscellaneous.

Besides the problems referred to above, the following were under investigation : (*a*) systems of replantation, (*b*) methods of mass selection, (*c*) progeny trial of uncontrolled matings, (*d*) variations in seedling characters between illegitimate families and (*e*) cytological studies.

Latin Square.—The results of the Latin square experiment which has been designed to study methods of mass selection were given in detail in the Annual Report for 1953. The data collected in 1955 are given below :—

	Selected Seedlings	*Unselected Seedlings*
Nuts per acre	4,066	3,617
Copra per acre (cwts.)	19.02	16.65
Nuts per candy of copra	1,068	1,087

The increase in crop due to seedling selection alone was 12.4 per cent in yield of nuts and 14.3 per cent in yield of copra. It is interesting to note that the selected seedlings have given an average of 4,066 nuts per acre during the 16th year after transplantation.

Polyploidy. The *typica* and the dwarf palms have a chromosome complement of $2n = 32$. Attempts made to see whether there are any natural poly-ploids proved negative. Therefore a number of nuts with developing embryos were treated with 1.0 and 0.5 per cent colchicine for periods varying between 6 to 24 hours. None of the embryos developed further with these treatments and consequently in a second trial lower concentrations of colchicine were used. These nuts have not been examined yet.

Nursery Trial. A preliminary trial to study the variations, if any, in seedling characters between families was completed. 230 open-pollinated nuts collected from a single pick of 15 mother palms were planted separately and the periods taken for sprouting, girth of ' collar ' and leaf number of seedlings were scored.

The differences in sprouting-period and seedling characters within families were not significant, whereas those between families were significant. This seems to indicate that certain mother palms give intrinsically better seedlings than others. It is proposed to repeat this experiment and collect further information.

D. V. LIYANAGE,
Botanist.

REPORT OF THE AGRONOMIST

The new Division of Agronomy was started in August 1955, when Mr. T. B. Paltridge arrived from Australia. Mr. Paltridge, a Principal Research Officer of the Australian Commonwealth Scientific and Industrial Research Organisation (C.S.I.R.O.) has been lent to the Government of Ceylon under the Colombo Plan and he will be stationed at the Coconut Research Institute for the next three years. His assignment is to study two things in this country: (1) The development and management of pastures that might be grown on Coconut Estates and used to provide meat and milk, without detriment to the coconut palm and (2) the wider problem of maintaining, and improving soil fertility in areas where the one crop has been, and perhaps will be grown for hundreds of years. He will also train staff to continue that work when he is recalled to Australia.

A qualified Assistant, Mr. K. Santhirasegaram, B.Sc. (Hons.) (Cey.) was appointed in November 1955, and the work of the new Division is now well under way.

Some preliminary trials with selected pasture grasses and two fairly comprehensive field experiments with all the known fertilizers (including trace elements) have been started, but the major work of the Agronomy Division must of necessity await delivery of special apparatus and equipment that have been ordered from England, U.S.A. and Australia. There is inevitably some quite considerable delay in starting any new Division, or a new programme of research, because the firms who manufacture scientific apparatus seldom carry large stocks and there may be a delay of four to five months before delivery.

On the other hand some equipment has already been obtained—ex-stocks Colombo, and a modern greenhouse, which is required for the work on trace elements is now being erected at Bandirippuwa. The preliminary work is therefore proceeding satisfactorily, and it is anticipated that by the middle of 1956 this new Division will be firmly established.

REPORT OF THE COMPUTER

During the latter part of the year, an agri-meteorological station was installed at Bandirippuwa Estate in the main coconut growing area to serve as a central reference station; three sub-stations are to be established in areas which appear to be marginal for coconuts and where the crops are declining.

This long-term project has been started to determine exactly the optimum and limiting conditions for coconuts and to examine statistically the variations in crop and the quality of

nuts with seasonal and annual variations in climatic, atmospheric and soil conditions and to serve as an auxiliary unit for other research divisions in work associated with meteorological factors. The main purpose is to determine whether it is climate or soil impoverishment which is responsible for the declining crops.

The previous system of meteorological recordings was found to be unsatisfactory as no single officer was responsible for the work and the aimless collection of data served no useful purpose. This work is now placed on a true research footing and with this end in view, the Computer of the Institute has been made solely responsible. In addition to his other duties, he is responsible for (1) the initiation of a specific programme of agri-meteorological research in close consultation with the Research Officers; (2) the maintenance of meteorological records and also relevant yield records; (3) the statistical investigation into agri-meteorological relationships; and (4) the expansion of the project by way of installing suitable sub-stations, etc.

We are guided in this project by advice received from the Department of Meteorology, Ceylon, the World Meteorological Organisation, the Food and Agricultural Organisation, and a number of eminent agri-meteorologists from all over the world.

The Computer was given special training in statistical methods and experimental designs at the International Training Centre organised by the F.A.O. in New Delhi, India and subsequently he was given a further three weeks training in meteorological recording at the Colombo Observatory.

Routine work

Daily at 0830 hours and 1730 hours, records are now maintained of atmospheric temperatures, relative humidity, terrestial radiation, solar radiation, soil temperatures at various depths, hours of sunshine, wind velocity, cloud conditions and rainfall.

The Botanist, the Superintendent, Bandirippuwa Estate, and the Technological Chemist have agreed to help in the recording of yield data, copra out-turns and the oil content respectively beginning from the first pick of 1956, and the 300 palm block of the Botanist has been set apart for crop recording. This block has been continuously recorded since 1931.

Investigations during 1955

(1) A statistical investigation was carried out with available yield records, into the relative susceptibility of the different stages of development of a bunch of coconuts to changes of the weather.

It was found that from the point of view of weather effects, the first three months from inflorescence is the most susceptible period in the cycle of development of a bunch of coconuts. The weather during this period is responsible for over 60 per cent of the total variations of the final crop due to weather.

(2) A further statistical investigation was commenced during the year with a view to determining the extent and the nature of the relationship between rainfall and crops in order to evolve a formula for predicting crops.

(3) The Computer is cooperating with the various research officers in the examination of their results.

V. ABEYWARDENE,
Computer,

REPORT ON CROP PROTECTION

When the expansion of research activities was begun this year, it was decided to establish a division to study methods of protecting the palm and its products from the diseases and pests. Laboratory space has been provided in the new building and the most essential equipment for the laboratory was supplied. When the new Crop Protection Division was set up in August, the Botanist was relieved of Crop Protection work.

Chemical control of Rhinoceros Beetle

The Research Assistant continued to work on problems and advisory correspondence in relation to crop protection. The investigation into the chemical control of rhinoceros beetle (Oryctes rhinoceros L.) larvae carried out in the laboratory in 1954 was extended to the field using pits in place of the earthernware pots. The pits which measured 4 ×.3 × 1 ft. were made in the ground in the nursery and filled with well decomposed farmyard manure. Thirty black beetle larvae were introduced into each of the pits which were protected against weather by a cadjan roof.

The more effective concentrations of the six chemicals which had been tried out in the laboratory trials were used for treating the pits. One of the pits which remained untreated formed the control. In the case of the D-D soil fumigant 2.5 c.c. of the chemical were poured into the holes, made 11 inches apart and 9 inches deep. These holes were then plugged with cow-dung. In all other cases sufficient quantity of chemical was applied to the pits by means of a watering can, fitted with a fine rose. Mortality counts were recorded daily and the results together with the treatments are indicated below :—

Insecticide	*Concentration*	*No. of days taken for complete kill*
D-D soil fumigant	2.5 c.c.	2
Dieldrex	0.5 per cent	4
Gammalin	0.1 ,, ,,	6
Agrocide	0.1 ,, ,,	6
Intox 'S'	0.1 ,, ,,	6
Aldrex	0.1 ,, ,,	8

From the above summary it is observed that all the chemicals have been effective in controlling the rhinoceros beetle larvae, but the action of some have been quicker than the others ; e.g. D-D soil fumigant and Dieldrex have killed all the larvae within four days of the application.

Biological control of Rhinoceros Beetle

The search for biological control of rhinoceros beetle is a pioneer investigation in this country, which was attempted along with the researches conducted by Dr. Venkatraman, Entomologist of the South Pacific Commission.

In this survey, extensive field observations were carried out in many parts of the coconut-growing districts of Ceylon. The actual investigation was a search for all insects in the breeding places of the Oryctes larvae and studying the habits of these insects to find whether any of them are parasitic or predaceous on the Oryctes rhinoceros.

The breeding places inspected, were fallen coconut stumps and other decaying logs in estates and back-gardens. Compost heaps, farmyard manure heaps, fibre dust heaps, coconut husk pits and breeding grounds in toddy collecting stations, were also examined.

Of the many types of insects found in association with the Oryctes larvae, the most promising predator insect was a click beetle larva (Elateridae-order-Coleoptera). Two species of this insect were met with—Agrypnus and the Alaus.

The following are the beneficial features in the Elaterid larva :—

(1) These larvae are found in the breeding places of the rhinoceros beetle grubs.
(2) Selective, because they go in search of Oryctes grubs for feeding.
(3) Oryctes grubs in all stages are attacked.
(4) The insect is not known to be harmful to other agricultural crops.
(5) It is not harmful to human beings; although it can pinch with its mandibles, the 'bite' is not venomous.
(6) Its larval period is long and in this stage, they predate on a series of Oryctes larvae in succession.

The less desirable features:

(i) Slow growing. The life cycle seems to be long.
(ii) The mass breeding of larvae for field release does not seem to be so easy and feasible.
(iii) They are cannibalistic in habit, so handling is difficult.

Further investigations are necessary before evaluating the real possibility of using this insect as an effective biological means for the control of Oryctes.

Soon after this new organisation was set up, the Crop Protection Assistant (along with the Chemist) visited the Coconut Research Station, Kayangulam, in India and some other research stations in that country, to study and discuss pest and disease problems common to both countries. A report of this visit was submitted.

Several letters were answered, much of the pest control advice being sought on termites. From visits made to estates on pest inspection, one serious incidence of Bud-rot affectation was noticed; and also a heavy attack of yellow scale infestation. The necessary recommendations were given.

It was reported that Perenox (one oz. in two gallons water) sprayed in a young plantation, after our recommendations, against Bud-rot, prevented the spread of the disease in one estate.

J. K. F. KIRTHISINGHE,
Crop Protection Assistant.

REPORT OF THE ANIMAL HUSBANDRY OFFICER

Mr. Gamini Goonasekera, Animal Husbandry Officer proceeded to Australia on study leave on a Colombo Plan Junior Fellowship and Mr. D. C. Ellewela, Animal Husbandry Assistant was in charge.

The amendments to the Food Production (Estates) Ordinance now provide for exemption from penalty to those coconut estates where dairy cattle are kept. It has been observed at Bandirippuwa Research Station in the wet zone (rainfall—70 inches) that milk can be produced at a profit from the ordinary Sinhala type village cattle, provided they are improved by selection and by good feeding with proper care and management.

The mixed rough pastures of grasses and legumes under coconuts must not be overgrazed, and the cattle require 3 lbs. of poonac a day as concentrates. It has been observed that pastures can be maintained without deterioration if there is rational grazing and a total cattle population of one animal to 2 acres is not exceeded under the climatic conditions at Bandirippuwa.

The Black herd of indigenous Sinhala dairy cattle at Bandirippuwa Estate and the Red herd at Ratmalagara Estate are being steadily improved by selective breeding and good management. The present herd strength is as follows :—

	Bandirippuwa Estate	*Ratmalagara Estate*
Adult cows	22	5
Stud bulls	2	1
Heifer calves	19	7
Bull calves	16	3

The quickest and surest way of increasing the milk supply is by the improved feeding and proper management of our Sinhala cattle. Feeding trials have been carried out for the last three years and a test yield of 9 pints have been achieved by Cow No. C.R.I. 27. This was recorded at the All Ceylon Stock Show held at Negombo on the 4th and 5th March, 1955. C.R.I. 27 won the Miller's Challenge Cup for the best milking cow of the Sinhala breed with a milk yield ratio of $3\frac{1}{2}$ gallons per 1,000 lbs. body weight. Three other animals from the Coconut Research Institute were placed in the 1st and 2nd classes. There has been one casualty during the year under review.

Sixteen heifer calves were being specially fed on the following test feeds during the year:—

(*a*)	Pasture grasses	Morlac plus churn minerals
(*b*)	,,	Xtralac plus churn minerals
(*c*)	,,	Parings poonac plus churn minerals
(*d*)	,,	Churn minerals only.

The experiment was designed on 4 × 4 Latin square basis.

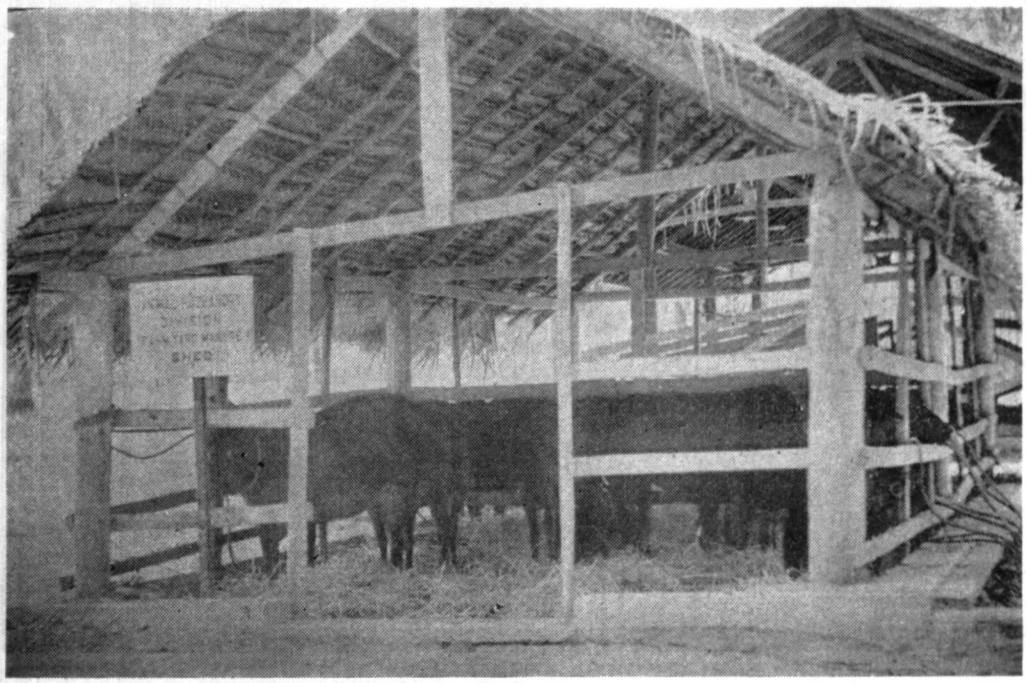
A preliminary statistical analysis of the rates of growth in weight of the animals was carried out and the results were as follows :—

Rate of growth of animals (adjusted for initial weight)

Feed	*Rate of growth per cent*
A	88.05
B	91.64
C	81.96
D	73.02

It is observed that Morlac and Xtralac are significantly better than the control. The difference between the other feeds were not significant although the figures show that parings too might be better than the control and ' B ' better than ' A '.

The experiment is being continued and further analysis of body measurements are in hand.



FARMYARD MANURE SHED

Morlac and Xtralac are solvent extracted poonac in which the oil content is approximately 2 per cent and 1 per cent respectively. The object of this is to give the young animals a good start in life in order to improve the standard of Sinhala cattle in succeeding generations.

The Red herd at Ratmalagara Research Station is being built up for the purpose of studying the correct conditions of maintaining dairy cattle in the semi-dry zone where it is more difficult to maintain pastures under coconuts during long periods of drought.

Both herds are being continuously recorded. Preliminary arrangements are being made at Bandirippuwa Estate to establish a feeding trial with different pastures and fodders, viz.—Bracharia brizantha, Paspalum commersonii, Bracharia milliformis and Guinea grass.

The estate section has been planted with the following fodder and pasture grasses: Elephant or Napier grass (Pennisetum purpureum) and Bracharia brizantha. This is intended to provide fodder during periods of drought when the ordinary pastures dry up. About 24,000 cuttings of Napier grass have been supplied free to coconut estates.

Pigs and poultry are being used for manuring purposes by being kept in portable pens which are moved from square to square at 7 and 3-day intervals and records of the coconut crops are being maintained. A new poultry run of one acre has been established in the old cover-crop demonstration plot. Beehives are also being maintained in the Botanist's mother palm block to improve the setting of the female flowers.

A course of training in dairy husbandry has been started during the year and two students from the Milk Board are at present under training.

D. C. ELLEWELA,
Animal Husbandry Assistant.

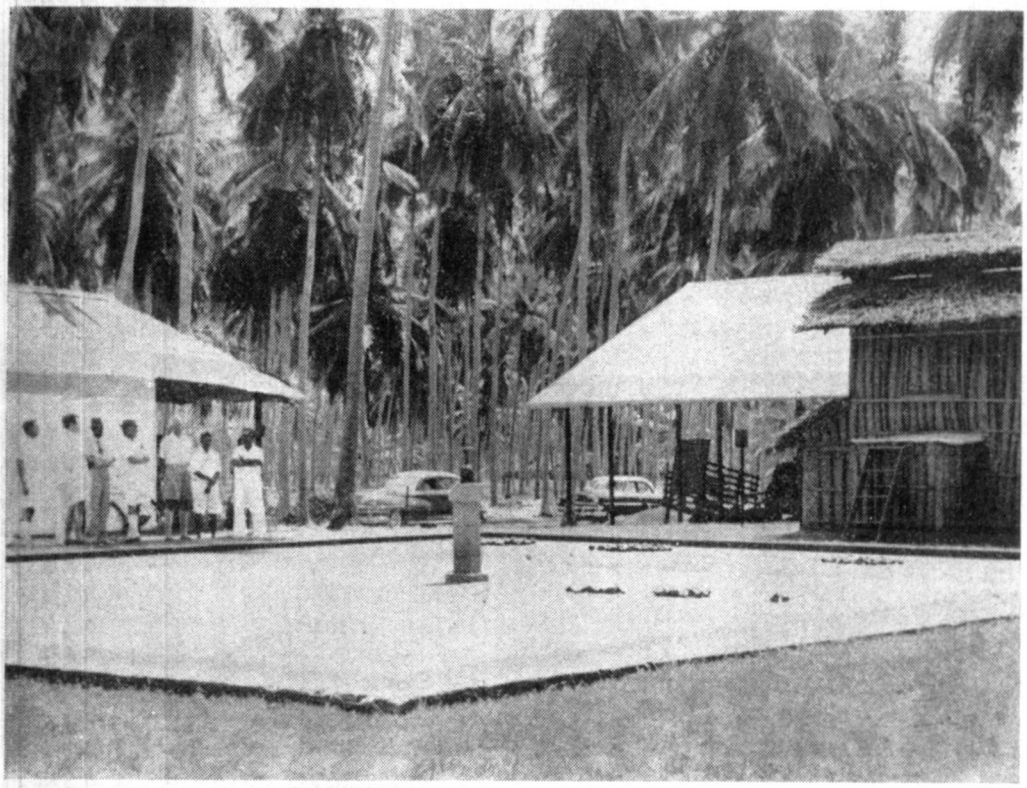
REPORT ON INDUSTRIAL RESEARCH

The Industrial Research Assistant assumed duties on 1st November, 1955.

2. A new type of copra kiln for smallholders to prepare white copra has been constructed. Experiments are being carried out on it and the results will be published in due course.

The kiln has a capacity of 1,500 nuts per day, and it is producing superior estate copra.

A. MAHESWARA,
Industrial Research Assistant.



SMALLHOLDERS' COPRA KILN

REPORT OF THE PLANTING DIVISION

Nurseries. The following quantities of seed-nuts were planted in the Nurseries during the year, 1955.

Name of Nursery	*Capacity*	
Ratmalagara	178,280	
Carmel and Karaweddana ..	185,450	
Walpita	148,400	
St. Anne's	40,000	
Labuduwa	39,000	
Hettipola	83,000	
Dunagaha and Veyangoda ..	49,500	
Batticaloa	10,000	
Killinochchi	85,800	
Kalawewa	90,000	
Dematawala	149,000	
Wilpotha	215,000	
Wennappuwa	30,000	1,303,430

A 10-acre block of crown land was made available at Karaweddana in Kurunegala District. A large Central Nursery was established here, which was formally opened by the Hon'ble Minister for Agriculture and Food. Pending the final acquisition of the 25 acres of land at Mylambavelly Estate, Chenkaladi, for a Nursery and Demonstration Plot, the old nursery site of the Department of Agriculture at Batticaloa, was taken over by us for establishing a Nursery. It is possible to accommodate only a small quantity of seed-nuts in this Nursery. In addition to the land at Mylambavelly Estate, Government has released 25 acres at Koggala, 25 acres of jungle land at Alampil, Mullaitivu and 12 acres at Eraminigolla, Kegalle, the last being Plant Supply Station of the Department of Agriculture.

Arrangements are being made for nurseries to be established at these Centres without delay. Seedlings will be made available from these nurseries in the coming financial year.

Seedlings. The demand for seedlings continued to be in excess of the available supply and the Coconut Research Board had decided on an equitable allocation to ensure a fair supply of seedlings to all applicants.

About 850,000 seedlings were supplied during the year.

Finance. The following is a statement of detailed expenditure for the year 1955.

Capital

Buildings	17,120.26	
Vehicles	13,599.00	
Tools and Equipment	1,691.10	32,410.36
Salaries		73,421.61
Travelling		19,963.28
Up-keep of Buildings and Machinery ..		1,518.48

Nursery Working Account

Seed-nuts	148,959.51	
Transport	28,502.08	
Maintenance	89,843.43	267,305.02
		401,753.64

Advisory Work

Field Days. A Field Day and Exhibition was organised at Udupilla by the Advisory Field Officer, Western Province. It was opened by the Hon'ble Minister for Agriculture and Food.

The Advisory Field Officer at Kurunegala was responsible for organising our Stall at the Kurunegala District Agricultural Exhibition. He also co-operated in the Field Day at Malkaduwa Group, organised at Kurunegala during the Soil Conservation Week.

A large number of estates and small-holdings were visited during the year for general advice.

A large number of requests were received for advice on lining work particularly on the Equilateral Triangular Planting System.

Our Officers have kept in touch with all the organisations such as Rural Development Societies, Co-operative Societies, etc. and periodical visits were paid to these Societies to advice the members on Coconut Cultivation.

The Advisory Field Officer, Chilaw, conducted regular classes for the trainees at the Rural Development Centre at Madampe.

It is gratifying to note that a large number of coconut growers are taking a keen interest in their plantations and I believe that this is due to the good work done by the Field Officers. With the proposed increase of Advisory Officers, it will be possible to give a satisfactory service to all coconut growers.

P. D. L. FERNANDO,
Planting Officer,
Planting and Advisory Division.

REPORT OF PUBLIC RELATIONS OFFICER

Mr. L. R. N. H. Perera was appointed Public Relations Officer with effect from 16th June, 1955. Duties assigned to him on appointment were, to act as Assistant Editor, *Ceylon Coconut Quarterly* and as Editor, *Pol Sangarawa*, to revise and edit planting leaflets, to organise courses of instruction for conductors and superintendents and to conduct field days and exhibitions on behalf of the Institute.

Exhibitions

During the past six months, three exhibitions were participated in. They are as follows :—

(*a*) Udupila
(*b*) Kadawatte
(*c*) Marawila.

Photography

Mr. D. B. Hettiaratchi was appointed Technical Assistant (Photography) on 11th July, 1955, in order to help the Public Relations Officer in preparing photographs for publication and exhibitions. He will also prepare technical films, koda slides and film strips for the purpose of instruction. 230 photographs were prepared during the period, the majority of which were developed, printed and enlarged in our temporary dark-room.

Publications

The first was the preparation of a brochure entitled ' Research and the Coconut Industry ' from material supplied by the Director. This was followed by the printing of a booklet containing papers read at the Coconut Conference on 29th August, 1955, in which was included the Address of the Governor-General of Ceylon, who declared open the above Conference. The same booklet was translated into Sinhalese and printed as a separate booklet.

The next publication was a brochure in Sinhalese entitled ' The Coconut Rehabilitation Project' published and distributed free on 14th October, 1955, with the opening of the new Carmel Nursery at Ibbagamuwa.

On a suggestion of the Coconut Research Board a Sinhalese News Sheet entitled *Pol Pawath* was published in November 1955. This is to continue as a regular quarterly issue. 1,000 copies of the first issue of this paper were found insufficient and 2,500 more copies had to be re-printed in order to meet the demand. The present demand for this News Sheet is in the neighbourhood of 6,000 copies per issue.

Display and Propaganda

Mr. A. W. Middleditch—the Colombo Plan Audio Visual Expert came here in July 1955 in order to instruct the Public Relations Officer and the Photographer on Visual Aid work and photography. The course of instruction lasted one month and a number of display panels

were prepared on his advise. More and more display boards are to be prepared and some of these will be on show at the Royal Agricultural Show at Colombo in 1956. It is proposed to make a few film strips during the coming year on directions given by Mr. Middleditch depicting various aspects of the Coconut Industry and Research Progress.

Meetings

The Public Relations Officer attended a meeting of the Thambarawila Rural Development Society, where he made a speech on ' The Services Rendered by the Coconut Research Institute to the Coconut Growers of Ceylon '.

Visitors

Conducting visitors round the Institute and showing them the work of various Divisions is also a portion of duty of the Public Relations Officer. A few of the parties that were shown round the Institute during the period were :—

A party of students and teachers from Central School, Lunuwila.

A party of students and teachers from Bandirippuwa Convent.

A party of students and teachers from Girls School of Agriculture, Kundasale.

A party representing the Rural Development Societies—from the R. D. Training Centre, Madampe.

L. R. N. H. PERERA,
Public Relations Officer.

REPORT ON THE ESTATES

Ratmalagara Estate

Crops harvested during 1955.

Crops	*Nuts from Estate area*	*Nuts from Research area*	*Total*	*Average 1951 to 1954*		*1954 above or below average*
I	55,974	21,931	77,905	59,474	+	31.0
II	85,470	33,500	118,970	75,916	+	56.7
III	84,272	33,518	117,790	99,160	+	18.8
IV	79,273	30,469	109,742	91,431	+	20.0
V	54,980	26,237	81,217	78,439	+	3.5
VI	41,340	20,690	62,030	64,514	−	3.8
Total	401,309	166,345	567,654	468,934	+	21.0

The crops were disposed of as follows :—

Sold on Contract	..	90,138	
Sold to Research	..	4,365	
Cured into Copra	..	455,537	
Allowance to Staff	..	6,152	
Empties and Rejections	..	11,462	—2 per cent.
		567,654	

The 455,537 nuts cured gave 377 candies 485 lbs. of copra, equivalent to an outturn of 1,237 nuts to a candy.

The revenue from Ratmalagara Estate actually accruing in 1955 was: -

Revenue from Estate Management			*Revenue from Research Management*		
Crops in 1954	Rs. Cts.	Rs. Cts.	**Crops in 1954**	Rs. Cts.	Rs. Cts.
Sale of Nuts ..	6,770.93		—	—	—
Sale of Copra ..	163.97		Sale of Copra ..	5,079.57	—
Sale of Sundries ..	264.00	7,198.90	—	—	—
					5,079.57
Crops 1955			**Crops 1955**		
Sale of Nuts ..	6,943.30		—	—	—
Sale of Copra ..	33,632.56		Sale of Copra ..	12,999.08	—
Sale of Sundries ..	196.29		—	—	—
Sale of Food Crops	35.13		—	—	—
Rubber Garden ..	1,279.76	42,087.04	—	—	12,999.08
		49,285.94			18,078.65

Total revenue for 1955 was thus Rs. 67,364.59.

Sundry Debtors and Creditors Account

Of the income accruing in 1955 and included in the above statement is Rs. 7,198/90 (Estate) and Rs. 5,079/57 (Research) from 1954 crops had been credited to the Estate Working Account for 1954 through Sundry Debtors Account. The Estate Working Account for 1955 does not therefore include this sum.

The following accounts have been credited to the Estate Working Account on account of 1955 crops lying unsold at the end of the year :—

1955 *Crops (Estate)*	Rs. Cts.	1955 *Crops (Research)*	Rs. Cts.
Sale of Nuts	4,923.15	—	—
Sale of Copra	407.00	Sale of Copra	4,880.07
Sale of Sundries ..	2,024.40	Sale of Sundries ..	851.96
Rubber Garden.. ..	139.26	—	—
	7,493.81		5,732.03

The expenditure for the year totalled including depreciation of kilns and animals Rs. 27,356/05. The cost of production of nuts on the estate area (including depreciation of kiln Rs. 565/14 and animals Rs. 47/25) was Rs. 68/16 per 1,000 nuts.

The Ratmalagara Estate Working Account for 1955 thus shows a balance Rs. 40,955/91.

(Sgd.) HENRY J. F. PEIRIS,
Superintendent, Ratmalagara Estate.

REPORT ON THE ESTATE 1955

Bandirippuwa Estate

Crop harvested during 1955 was—

Crop	*Nuts from Estate area*	*Nuts from Research area*	*Total*	*Average 1931 to 1954*	1954 *above or below average*
I	80,880	14,228	95,108	67,840	+ 40.2 %
II	107,850	14,744	122,594	108,371	+ 13.1 %
III	107,210	16,157	123,367	131,692	— 6.3 %
IV	108,800	17,599	126,399	117,641	+ 7.4 %
V	72,959	12,577	85,536	80,951	+ 5.7 %
VI	49,853	10,823	60,676	63,541	— 4.5 %
Total	527,552	86,128	613,680	570,036	+ 7.7 %

The nuts were disposed of as follows:—

Sold on Contract	83,540 nuts	
Sold of Planting Division ..	5,029 ,,	
Sold for Research	3,846 ,,	
Research Nurseries	1,494 ,,	
Cured into Copra	496,687 ,,	
Allowance to Staff	17,357 ,,	
Empties	5,727 ,,	0.9 %
Total	613,680 nuts	

The 496,687 nuts cured gave 414 candies 233 lbs. of copra and an out-turn of 1,198 nuts to a candy.

The revenue from Bandirippuwa Estate actually accruing in 1955 was—

Revenue from Estate Management

Crops in 1954	Rs. Cts.	Rs. Cts.
Sale of nuts ..	6,599.44	
Sale of copra ..	4,188.22	
Sale of shells ..	56.00	10,843.66
Crops in 1955		
Sale of nuts ..	9,321.92	
Sale of copra ..	43,850.38	
Sale of sundries ..	1,788.68	54,960.98
		65,804.64

Revenue from Research Management

Crops in 1954	Rs. Cts.	Rs. Cts.
Sale of nuts ..	72.83	
Sale of copra ..	2,239.62	
—	—	2,312.45
Crops in 1955		
Sale of nuts ..	2.60	
Sale of copra ..	8,693.34	
—	—	8,695.94
		11,008.39

Total revenue for 1955 was thus Rs. 76,813.03 cts.

Sundry Debtors and Creditors Account

Of the income accruing in 1955 and included in the above statement is Rs. 10,843.06 (Estate) and Rs. 2,312.45 (Research) from 1954 crops had been credited to the Estate Working Account for 1954 through Sundry Debtors Account. The Estate Working Account for 1955 does not therefore include this sum.

The following accounts have been credited to the Estate Working Account on account of 1955 crops lying unsold at the end of the year:—

1955 Crops (Estate)	Rs. Cts.	1955 Crops (Research)	Rs. Cts.
Sale of nuts	4,771.93	Sale of nuts	230.85
Sale of copra ..	3,960.66	Sale of copra	1,943.22
Sale of sundries ..	4,178.39	—	—
	12,910.98		2,174·07

The expenditure for the year totalled, including depreciation of kiln and animals Rs. 29,990.32 cts. The cost of production of nuts on the estate area (including depreciation of kiln Rs. 168/12 and animals Rs. 40/82) was Rs. 56.84 cts. per 1,000.

The Bandirippuwa Estate Working Account for 1955 thus shows a balance of Rs. 48,751.65 cts.

D. F. WITHANA,
Superintendent,
Bandirippuwa Estate.

1379—E

POST BAG

CP/C/2.
18th August, 1956.

Estate,
Kotmale,
Ceylon.

Dear Sir,

Leaf-eating Caterpillar

Reference your letter of 15th instant, I wish to refer you to our letter CP/C/2 of 14th July, 1956. The inspection was done on Tuesday, 17th July. The pest is a leaf-eating caterpillar samples of which were collected for identification.

The extent of damage was considered to be small and does not warrant the application of insecticides.

The conductor was instructed to hand pick the caterpillars and destroy them.

The conductor should do a periodical examination, say every five days, and look for caterpillars on every seedling. He was also advised to slash the weeds down, round seedlings.

The butterflies which emerged from the cocoons of the caterpillars, have been sent for identification.

Yours faithfully,
(Sgd.) HILARY F. GOONAWARDENE,
Crop Protection Officer,
Coconut Research Institute.

(Superintendent)

Estate,
Kotmale,
Ceylon.
10th July, 1956.

The Director,
Coconut Research Institute,
Lunuwila.

Dear Sir,

A serious leaf disease is affecting my young palms in Pothuwewa Estate, Pannirandawa, and I suspect that coconut caterpillar is attacking the leaves.

I would be much obliged if you can get a member of your staff to visit same and send me a report as to the control of the disease. I would urge you to take immediate steps before serious proportions are assumed.

This estate lies roughly 100 to 200 yards off your Ratmalagara Nursery on the Villatuwa side.

Thanking you.

Yours faithfully,
SUPERINTENDENT.

Nugegoda.
6th August, 1956.

The Director,
Coconut Research Institute of Ceylon,
Bandirippuwa Estate,
Lunuwila.

Dear Sir,

Beetle Menace

I beg to state that nearly eight (8) young King Coconut Palms in bearing are being attacked by the beetle. Inspite of repeated attempts in cleaning up their crowns, etc. The pest is yet not under control. As a last resort I look to your Institution for necessary guidance and help.

Thanking you for an early reply.

I remain,
Yours faithfully,
Sgd. FERNANDO.

Coconut Research Institute,
Lunuwila.
18th September, 1956.

Dear Sir,

Black Beetle Menace

Reference your letter dated 17th August, 1956.

It is regretted that although we have given you all the advice which is at our command you have not succeeded in controlling the pest. I fear that this breeding occurs not only on your own land but also on adjoining land, and possibly may be on compost heaps or some decaying organic matter.

I would suggest that as we have given you all the advice available you kindly do a personal search for these breeding places and report the matter to us. If you have been successful in tracing these sources of breeding and if you are unable to use your methods of persuation and suitably disposing of these breeding places in accordance with the publications sent to you, we will undertake to report the matter to the Department of Agriculture so that they can put the penal clauses of Plant Protection Ordinance into operation.

Our officers do not undertake the latter function as according to the directive of the Coconut Research Board, we have to maintain the goodwill of the coconut planters.

If there is anything further we could do in the matter, please do not hesitate to write.

Yours faithfully,
(Sgd.) M. L. M. SALGADO,
Acting Director,
Coconut Research Institute.

18th July, 1956.

Reply

The Chairman,
Ceylon Coconut Board,
P.O. Box No. 386,
Colombo.

Dear Sir,

Reference your letter dated 5th July, 1956, re. the inquiry from the Secretary, Indian Central Coconut Committee, Ernakulam, I give below certain available data which I hope will meet your requirements :—

Crop per Acre for period January to April

Areas	1950	1951	1952	1953	1954	1955	1956
Lunuwila ..	997	1,365	1,365	831	1,286	1,578	924
Madampe* ..	864	911	928	946	1,251	1,392	1,085
Kudawewa ..	1,025	1,344	875	910	932	863	744
Giriulla ..	592	839	967	784	918	1,155	data not received
Tirukkovil ..	312	519	316	514	436	422	662

*This Estate consists mostly of young plantations.

Reports indicate that during the first half of 1956, coconut crops have been relatively low in most areas. Reliable statistics based on the crop data of sample estates are given below.

A particular year's crop is determined mostly by the extent and distribution of rainfall during the previous year, which is the period covering the formation of nuts and development of the bunches that mature during the current year. The current year's weather, however, can affect the crop only from the point of view of heavy immature nut-fall caused by the occurrence of undue dry spells and/or perhaps the amount of sunlight.*

Our observation is that rainfall in most parts of the Island was not abnormally low in 1955, but its distribution over the year was relatively poor. This situation was further aggravated by the unusual drought conditions experienced in most parts from the end of 1955 to about May 1956. These adverse conditions can reasonably explain the low yield in the first half of the year.

As for the two Estates in our charge—viz. Bandirippuwa and Ratmalagara for which detailed statistics are available, our investigations show that the fall in crop is well within the tolerable limits of fluctuations due to weather.

A proper appraisal on an Island-wide basis of the yield in relation to rainfall requires involved statistical treatment and as such I hope the above explanation will suit your present needs.

It is difficult to estimate the effect of the incidence of pests and diseases under our conditions in Ceylon based on the recent advisory work carried out by our new Crop Protection Division, the incidence of pests and diseases show any marked variation from the previous years.

*These matters are under investigations by us at the Coconut Research Institute.

Unlike in South India, our pests both insect and fungal, are kept well under control and cannot be considered as a factor which affects crops to any tangible extent.

When this information is forwarded by you to the Secretary, Indian Central Coconut Committee, Ernakulam, it will be appreciated if due acknowledgement is made to us.

Yours faithfully,
(Sgd.) M. L. M. SALGADO,
Acting Director,
Coconut Research Institute.

The Ceylon Coconut Board,
No. 49/17, Iceland Buildings,
Galle Face,
Colombo 2.

The Acting Director,
Coconut Research Institute,
Bandirippuwa Estate,
Lunuwila.

Dear Sir,

We have an enquiry from the Trade Department of the High Commissioner for Ceylon in India asking us information regarding the condition of the coconut crop for the current year in Ceylon as compared to the previous years. We are asked also for the reasons for the abnormal variation in yield if any, the effect on the crop of seasonal factors and rainfall during the last two years and of pests and diseases on current year's crop. I shall be very much obliged if you could send me a note on this subject as this Board, which is concerned mainly with marketing, is not as qualified as you are to submit this information.

Thanking you.

Yours faithfully,
(Sgd.) C. H. Z. FERNANDO,
Chairman,
Ceylon Coconut Board.