REPORT ON A VISIT TO SOUTH INDIA

By E. MUTTUKUMARU,
Chairman, Research Committee
and
F. C. COOKE,
Director, Coconut Research Institute of Ceylon.

Purpose

(1) To see the principal coconut-growing areas of South India.

(2) To study the work of the Coconut Research Stations and Agricultural Research Institutes.

(3) To consider the organisation of research and extension work on coconuts and the five-year plan for the rehabilitation of the industry.

THE COCONUT INDUSTRY OF INDIA

It was not possible in the short time at our disposal to make more than a superficial survey of the Industry.

Acreage

The total area under coconuts in 1950/51 was stated to be 1,548,098 acres distributed as follows :—

Travancore-Cochin	661,442 acres
Madras	637,314 ,,
Mysore	185,715 ,,
Bombay	31,535 ,,
West Bengal	16,500 ,,
Orissa	11,019 ,,
Assam	3,573 ,,
Others	1,000 ,,

According to the statistics contained in the Report on the Marketing of Coconut Products (AMA 32 of 1943) the total acreage under coconuts is increasing.

Year	Acreage
1920/21	1·2 million acres
1925/26	1·3 ,, ,,
1929/30	1·4 ,, ,,
1938/39	1·5 ,, ,,
1950/51	1,548,098 ,,

Production

The total production of coconuts in India in 1950/51 was estimated to be 3,323,564,000 nuts which is equivalent to an overall average of 2,150 nuts per acre but only about ten nuts per head per annum and all used for domestic consumption only.

(The corresponding figures in Ceylon are 2,160 nuts per acre (five-year average) and 300 nuts per head per annum, including exports. The area under coconuts is 1,075,000 acres).

Coconuts planted on the bunds of lagoons

Photo : Indian Central Coconut Committee.

A five-year plan for Rehabilitation has been launched whereby it is estimated that crops can be increased by 25 per cent. by improved agricultural practice and by a further 5 per cent. by new planting. The success of this plan will depend largely on the growers.

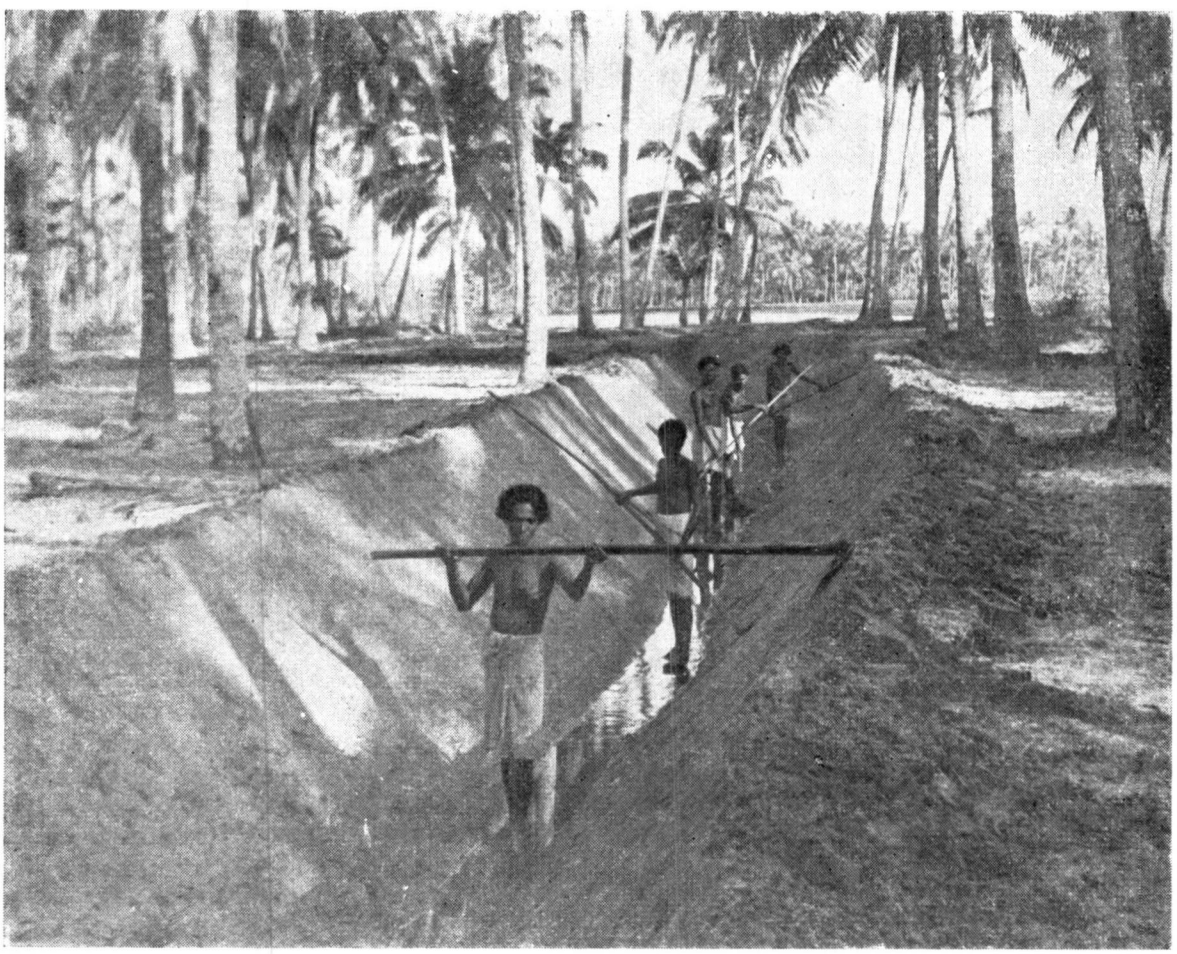
Nature of the Industry

The Coconut Industry in India is almost entirely a small-holders' industry, and the largest area under single ownership was said to be a 300-acre estate in Madras. Squatting on estates by

Cultivation of coconuts by mounding the soil in heaps.

Photo : Indian Central Coconut Committee.

landless people was said to have become a serious problem. Elaborate precautions have also to be taken against coconut stealing. Groups of small properties are generally enclosed inside high mud walls of massive construction, topped with tiles, kadjan roofs, or cactus plants and where there are no walls the trunks of the palms are wrapped with dry plaited fronds to give warning of marauders.



Main drain with sides of beaten earth. 4 ft. 6 ins. deep.

Photo : Indian Central Coconut Committee.

The coconut lands have become reduced by successive inheritance or by sale down to tiny properties consisting in some cases of only one or two palms and even these may be shared. In Madras, a one year's moratorium has been declared on all debts owed by owners of agricultural lands.

Cultivation

The coconut lands seen fall into three categories :—

(1) Inland areas—flat or undulating land ;

(2) Coastal areas—adjacent to the sea ;

(3) Lagoon areas.

The best coconuts seen were growing on the alluvial soils in the extensive lagoon areas at some distance away from the sea where the irrigating waters are slightly brackish ; the worst coconuts seen were on sandy stretches on the seafront where the palms were wide-spaced. The coconuts in inland areas were growing on varying types of soil and in some cases were irrigated.

Elaborate precautions are taken to retain soil moisture by cultivating and heaping the soil in small mounds within individual plots which are each demarcated by low mud bunds, about one foot high. In addition, terracing of sloping lands was a common practice. This was achieved by levelling the land and building elaborate retaining walls or bunds at successive levels. This all serves to hold the rain where it falls and to prevent run-off and soil erosion during heavy monsoonal rains.

In addition the draining and bunding of the palms in low-lying areas is most elaborate. Deep wide drains are cut between the lines of palms and the land is raised with the excavated soil.

Planting distances were generally irregular. In places, palms were only about six feet apart, but mostly the palms were from 18 feet to 24 feet apart. In a few instances wide planting, 30 feet apart, was seen but the palms suffered from drought because the land was not shaded from the sun.

Very little if any artificial manuring of coconuts is practised in India. The growing of green manure crops and the application of fish meal, ground nut cake, cattle manure and wood ashes and the close association of the palms with human habitations appear to be the secret of successful cultivation.

The raising of catch crops appears to be a necessity in certain parts of the West Coast which is a deficit tract in regard to food crops. Manioc, pineapple, gingelly, chillies, ginger, pepper, turmeric, plantains were seen mostly where the coconuts were poor so that the shade was not excessive. In the extreme south palmyrah palms and cashew trees were interplanted with coconuts but in such cases the coconuts were all very low-yielders.

Marginal Areas

Special attention must be drawn to the fact that cashew and casuarina can be grown on poor sandy and leteritic soils in marginal areas where the yields of coconuts are unsatisfactory. It is accepted in India that to grow coconuts under unsuitable conditions is economic waste.

We feel that special encouragement by Government must be given to the commercial cultivation of cashew and casuarina in the marginal sea-coast areas of Ceylon.

The *cashew* is a hardy drought-resistent tree, capable of thriving under varied conditions of soil and climate. It is essentially a wasteland crop, requiring little cultural attention but growing best in the humid atmosphere near the sea. The tree was originally introduced into India from Brazil by the Portuguese, some 400 years ago. A flourishing industry has since developed with an estimated annual output of over 60,000 tons of nuts, and in 1948 kernels valued at 15,000,000 U.S. dollars and cashew oil worth 500,000 dollars were exported from India. In recent years, the demand for cashew nuts, principally from the U.S.A., has increased markedly and India is by far the largest producer in the world.

It was stated that at present 40,000 tons of raw cashew nuts are imported into India from Portuguese East Africa and 25,000 tons are produced in India. These are processed in some 27 factories, each employing between 500 and 1,000 people, mostly women. As the raw nuts can be kept for two years without deterioration it is possible to maintain these factories in almost continuous operation.

An adult tree is capable of yielding up to 100 lbs. of nuts per annum, though the average on the West Coast is said to be only 20 lbs. This is because there is great variation in the trees with different growth habits and yielding capacities. The tree commences to bear from the third or fourth year onwards and is in full bearing in the tenth. Each tree in addition produces about 75 lbs. of apples which are largely wasted but the juice can be converted into syrup or alcohol.

The processing of the nuts is simple but needs to be properly organised in view of the large staff employed. The nuts are soaked for two hours and left to ferment for 24 hours. They are then fed into the hopper of a continuous roaster where the nuts are exposed to direct firing for 2½ minutes. The skin oil is exuded and the mixture of nuts and oil is separated in a slow speed centrifuge. Then the nuts are shelled, by hand, dried in a tray drier, peeled by hand and graded into three grades and packed under vacuum for export

The importance of this crop is to be judged from the fact that a research station has been established to study the different varieties, methods of propagation and cultivation, pest control and also its products.

The *casuarina* is a tree of rapid growth which was introduced into India about 60 years ago. It produces a good fuel but it is not of much use for timber. Owing to the increasing scarcity of fuel, the area under casuarina is increasing and some areas which are useless for coconut are now being planted with this crop.

The trees are first raised in nurseries and the seedlings are planted in holes nine inches deep, set 4½ feet apart. It is thus possible to put down over 2,000 trees in an acre and at the end of four years, the plantation is thinned down to about 1,500 trees per acre by the removal of the weaker plants.

The plantation which requires no further attention is cut at the end of 8 to 10 years when each tree will fetch from 7 As. to 8 As. depending on the locality, *i.e.*, a yield of about Rs. 700 per acre. If the trees are planted wider,—say 500 to the acre, the resulting larger trees are worth more.

Utilisation of the Coconut Crop

Coconuts are produced in India entirely for domestic consumption.

Milling copra is estimated to represent 25 per cent. of the total crop, the balance is used directly for edible purposes, being consumed either in the form of young nuts for drinking and as mature

nuts for the production of graded coconut and also as food in the form of "boll" copra and "edible white" copra.

"*Boll copra*," amounting to over 21 per cent. of the total crop (*i.e.*, 600,000,000 nuts) is obtained when mature nuts are stored in deep shade for a period of eight to twelve months on a raised bamboo platform with an occasional firing of husk or coconut shells. The coconut water is gradually absorbed by the kernel which gradually shrinks and becomes detached from the shell. The resulting ball of copra is clean, dull white and exceptionally sweet.

"*Edible White*" *copra*, is produced in one district by sundrying mature nuts and then drying them over charcoal fires.

"*Milling Copra*."—A high standard of quality was required when India used to export copra, and Cochin coconut oil used to be the paramount grade in the world's markets. Today quality is not so essential because the copra is all milled in India with little delay and there is less time for serious deterioration and loss.

The copra is now generally under-dried because this is allowed for in the price paid by the millers and unripe nuts are generally used because the husk from these nuts is the best for the production of coir yarn. Fish nets are hung over the barbecues to prevent birds stealing and soiling the copra.

Oil Milling.—Copra is crushed mostly in chekkus in the coconut growing areas but in important industrial centres, such as Karachi and Bombay, power presses and rotary expellers are used.

The ordinary bullock-driven chekku is slow and inefficient and often between 20 and 25 per cent. of oil is left in the cake and today their use is said to be decreasing.

Power-driven chekkus, in which both the pestle and the mortar revolve, and which move at higher speeds, have largely displaced the village chekkus because of their higher rate of output and extraction efficiency. The residual cake was said to contain 10 to 12 per cent. of oil.

Two such installations were inspected. One consisted of 11 mortar mills which together with disintegrating equipment and the building was said to cost Rs. 50,000. The largest installation has 50 chekkus.

Coir Yarn.—When nuts are harvested for the production of coir in India, unripe nuts are preferred because the resulting yarn is whiter and stronger. Generally nuts between 8 to 11 months old are used with the result that less copra is obtained and the copra is not of such good quality as that obtained from ripe nuts.

The husks at present coasting Rs. 15/- per 1,000 are crushed and dumped in a muddy hole just above low tide level and they are washed by the rise and fall of the brackish tidal waters in the lagoons. The sides of the pit are usually lined with coconut leaves and the husks are covered with leaves and mud. The time required for retting is about six to eight months. Retting is quicker in fresh water but when husks are retted in saline backwaters, they yield a stronger and better coloured fibre. When retting is done in stagnant water, the fibre is said to be weaker and of a dull colour.

The retted husks are washed with water to remove the mud and slime and the outer skin is peeled off. The washed husks are then beaten by hand with wooden mallets on wooden blocks to separate the fibre from the cork and pith. The wet fibres are then laid out to dry. The fibres so obtained are graded for colour and are used for spinning into yarn. This is essentially a cottage and not a factory industry as it is in Ceylon.

COCONUT RESEARCH AND EXTENSION WORK

Administration

Research on coconuts in India comes directly under the Ministry of Agriculture in New Delhi and it is administered under the Indian Coconut Committee Act of 1944 through the Indian Central Coconut Committee (President: Shri K. R. Damle, I.C.S., with the Secretary, Shri K. Gopalan, as the principal Executive Officer). The Secretary is responsible for recording the minutes of the Committee and of the Financial Sub-Committee, for the control of the Staff, and the publication of periodicals, posters and leaflets.

The Committee meets at least twice a year, in such places as New Delhi, Bombay, Calcutta, Madras, etc. The Administrative Headquarters are at Ernakulam on the Malabar Coast.

The Committee consists of 25 members as follows:—

President: The Vice-Chairman, Imperial Council of Agricultural Research.

Nine Government nominated representatives of the growers in Madras (2), Travancore (2) Bombay, Bengal, Orissa, Mysore and Cochin.

Five representatives of the millers, individually nominated by the Governments of Madras Travancore and Cochin and by the Indian Merchants' Association, Bombay, and the Bombay Chamber of Commerce.

Three representatives of the Government of Madras, Travancore and Cochin.

One representative nominated by the Travancore Chamber of Commerce and *one* by the Central Government.

Six representatives of the Legislature and State Councils.

The Joint Directors of the two Research Stations and the Secretary are in attendance making a total attendance of 28 at these meetings, for which the necessary quorum is ten.

Income

The income of the Committee is obtained by means of a cess of 4 As. per cwt. on all copra processed in the oil mills. This cess is collected by the Excise Department, less a 3 per cent. collection charge. The assessments are based on a monthly statement of production by each mill, giving the weight of copra consumed, and of the oil and oil-cake produced.

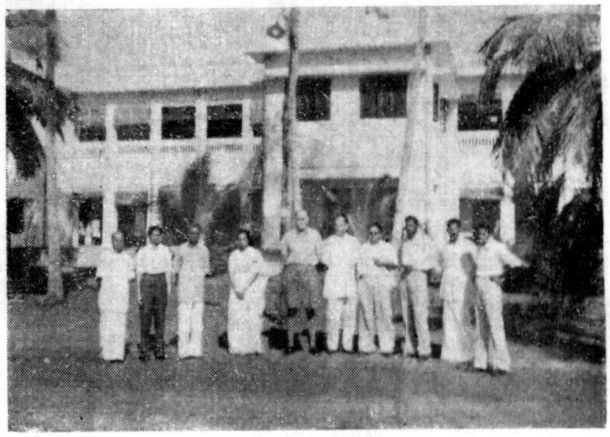
Cess collections are derived mostly from Travancore-Cochin and Madras and it was stated that only about 25 per cent. of the total production now pays cess, because 54 per cent. of the crop is directly consumed as food and drink, 21 per cent. is converted into "boll" copra (*i.e.*, preserved coconut meat which is used as food and for ceremonial purposes), and the coir industry does not pay cess at all. The total income of the Committee was said to be about Rs. 750,000 per annum from 1½ million acres of coconuts.

Organisation of Research

There are two Central Coconut Research Stations and six Regional Sub-Stations, and in addition laboratory research in relation to coconuts is carried out at the Agricultural Research Institute at Coimbatore as part of a general programme of Agriculture Research.

The Coconut Research Station at Kasaragod in Madras which is about 25 miles south of Bangalore (Director, Shri C. E. M. John) is concerned mainly with plant breeding and the botany, the physiology and the nutrition of the palm and with cultivation and manurial trials, and the maintenance of a complete agri-meteorological station to study the effect of climate on crops, on pollination and on the incidence of pests and diseases, and finally the possibilities of alternative crops on marginal coconut lands.

The Research Station at Kayangulam in Cochin-Travancore State, about 70 miles south of Ernakulam (Director: Dr. K. P. V. Menon) is working mainly on the pests and diseases of the coconut palm—their cause and their cure.



Visitors and Staff of the Coconut Research Station at Kayangulam

We saw only one of the six sub-stations. These are intended to investigate local problems on the spot and the cost of their maintenance comes half from State revenues and half from the funds of the Central Coconut Committee. Three of the Stations are in Travancore-Cochin State and there are one each in Orissa, Bengal and Bombay. A graduate officer is attached to each sub-station.

Extension Work

Research Officers do not appear to be concerned with the propagation and the application of the results of research and in that sense would appear to be rather isolated from realities because there is no overall Director to co-ordinate activities. The Head Office of the Indian Central Coconut Committee at Ernakulam is responsible for the publication of periodicals, posters and leaflets, the Field Officers of the Department of Agriculture for advisory work in the field, and the Oilseeds Specialist of the Agricultural Research Institute at Coimbatore for the production of seedlings and their distribution through State Directors of Agriculture.

Publications and Propaganda

The Indian Central Coconut Committee publishes monthly a popular Bulletin in three languages, prints 7,000 copies per issue and sells them to the public at a cost of 8 Annas (about 50 cents) per annum. It also publishes quarterly "The Indian Coconut Journal" for which the annual subscription is Rs. 2·00 and it issues posters, technical bulletins and planting leaflets. The Secretary of the Committee, Shri K. Gopalan is the Editor.

Planting and Replanting

There has been much publicity for the Five-Year Plan for the Rehabilitation of the Industry, but progress to date does not appear to be adequate in view of the alarming increase in population and the volume of unemployment in this vast sub-continent. The production of seedlings is however proceeding on an increasing scale and in four years a total of 587,000 seedlings produced from 832,000 seednuts, collected from selected mother-palms have been sold to the public. (Approximate total acreage : 8,000).

The production of seedlings does not appear to be subsidised as in Ceylon. We were informed by the Oilseeds Specialist that selected seedlings were being produced at a production cost of 6 Annas each, plus 2 Annas for administration and distribution, and they were sold to the public at 8 Annas (50 cents) each through State Departments of Agriculture.

The procedure adopted is for the planting assistants to survey the coconut areas and select the best gardens and the best palms in those gardens. On the West Coast, seednuts are collected during the February-April season only as these are the biggest nuts with the highest percentage of germination because they received the summer rains during the initial formative months. Nuts which are to be used for raising seedlings are allowed to become full ripe on the tree and to drop down by themselves. As a result of careful selection of seednuts the yield of selected seedlings has risen from 60 per cent. to 70 per cent. and is expected to go up to 80 per cent.

RESEARCH WORK IN PROGRESS

Coconut Research Station, Kayangulam (57 Acres)

The purpose of this station is to study the underlying causes of susceptibility to pests and diseases and determine the best method for their suppression and control.

The establishment has four main divisions :—

Entomology	Soil Chemistry
Pathology	Plant Physiology

The Institute employs at present 3 Ph.D's ; 2 M.Sc.'s ; 7 B.Sc.'s ; and 1 B.A., a total of 13 graduates, with vacancies on the establishment for 3 more. These have been mostly trained at Travancore and Madras Universities and none have yet been sent on specialist overseas training.

Entomological Division

Principal Pests—

Coconut Beetle	Termites
Coconut Caterpillar	Rats and Bats
Red Beetle	Six Minor Pests
White Grub (Lecuphora spp.)	

Coconut Beetle.—Benzene hexachloride in minute doses sprayed in breeding places has given 95 per cent. control. This was the best out of nine chemicals tried. The green muscadine fungus has not been effective in India possibly due to environmental conditions.

Coconut Caterpillar.—These are mostly found near the sea coast. *A foliar spray consisting of* 0·2 *per cent. D.D.T. has given excellent results* and has trebled crops in the affected areas.

Control by Eulophid parasite is said to be not as effective in India as it is in Ceylon.

Red Weevil.—This breeds only in living tissue. Where several palms are attacked they inject 1,500 c.c.'s of an aqueous solution of pyretheum and papsinol butoxide (accelerator) into the soft top wood through a copper pipe. The palm itself is not affected by this treatment.

White Grubs, (a cock-chafer).—This attacks the roots and the only visible symptoms are the absence of nuts as the palms look otherwise healthy. This pest was only found recently never previously having been even suspected. They are now dusting the soil with benzene hexachloride three times a year, but this control has not yet been proved effective.

Nematodes.—Symptoms: Seedlings in nurseries die from no apparent cause. The rotten central shoot is found to be full of nematodes. No control has yet been found.

Minor Pests.—Several others attack seedlings in the nursery stage.

Pathological Division

Principal problem is root disease of coconuts causing crown wilting, yellowing and necrosis of leaves and shedding of nuts. The root decays and after some time all the leaves fall off. It is like tapering disease.

Three root fungi have been discovered. It has not, however, been found possible to transmit the disease either by injection or by grafting a diseased root on to a sound one. Water-logged conditions appear to be one causative factor.

Phythophtera is rare in India.

Soil Chemistry

The object of this division is to connect plant weakness with unsatisfactory soil conditions.

They have examined a very large number of soil samples and have now laid down arbitrarily the following lower limits for healthy growth :—

N	...	...	...	...	0·15%	Ca	...	...	... 0·5%
P	...	...	...	...	0·15%	pH	...	...	... 5·5—7·0%
K	...	...	...	...	0·25%				

They consider calcium acts both as a buffer agent and also as a plant nutrient and that soils should be adjusted to the pH limits indicated above.

They are examining soils for trace elements using a Lumeton colorimeter made by the Photovolt Corporation, New York.

They are also studying the effect of different additions of salt to the soil in increasing soil moisture. They consider sea salts are necessary to coconut to supply essential trace elements or to improve soil moisture.

Plant Physiology

This division is studying the empirical application of trace elements singly and in combination as foliar sprays or applied directly to the soil. They have also developed a root injection technique using a seedling with the husk removed and introducing the trace element through a single root from the solution in a flask.

Coconut Research Station, Kasaragod (144 Acres)

The purpose of this station is to study breeding, manuring and agronomical problems. The establishment has four main divisions :—

Botany and Planting-breeding	Chemistry
Cyto-Anatomy	Agronomy

This Institute employs six graduate officers with vacancies for four more, to be filled when funds are available.

The station cost Rs. 250,000 to acquire and it costs about Rs. 100,000 per annum to maintain. It is very well maintained indeed with excellent roads, sound outer walls topped with aloes, and remarkable terracing of sloping lands with rammed retaining walls at different levels. There are also minor dividing soil walls 1 ft. high to retain rainwater and demarcate plots. The rammed walls of the estate are 4 ft. wide at the base and 1 ft. at the top, and cost 12 annas per running yard to construct, *i.e.*, a wall 200 yards long cost Rs. 150/-, compared with Rs. 300/- in Ceylon for posts, barbed wire and erection.

Botany and Plant Breeding

The palms are used as notice boards, each palm is named and numbered beautifully. The programme includes : (*a*) the collection of varieties of " Cocos " from all parts of the world ; (*b*) the study of Indian varieties and forms; (*c*) study of mother palms and their progenies; (*d*) production of crosses ; (*e*) possibilities of related species of cocos.

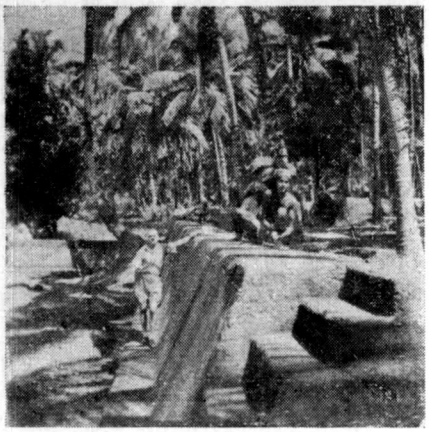
Meteorological Station

This is an Agri-Meteorological Station to study the relationship between yields and climate and is for research on the causes of pest and disease attack, on the movement of pollen and setting of nuts, and the effect of incidence of rainfall on soil conditions.

The Station is in a locked enclosure, about 100 yds. × 100 yds. It includes the usual Stevenson screen instruments, a rain gauge and a sunshine recorder. In addition there is a continuous recording raingauge and continuous humidity recorder ; a soil evaporimeter to measure rate of loss of moisture from columns of soil (Kaygee Industries, Poona) ; a U.S. open pan evaporimeter ; anemometers at 10 ft. and 25 ft. levels ; Dr. Mehta's aeroscope for pollen collection and soil thermometers at three levels up to 10 feet. All records are reported to the Central Meteorological Station at Poona where the recorder received his special training.

Dr. Mehta's Aeroscope is a particularly interesting instrument. It is simply a wind vane with slots to take a microscope slide so that the slide is always facing the prevailing wind. It can be used to measure pollen movement and availability of pollen under different climatic conditions.

THE COCONUT RESEARCH STATION AT KASARAGOD



Contour bunds made of beaten earth

Main entrance, showing typical mud wall

Monthly technical discussion at Kasaragod

A mother palm at Kasaragod

Photos : Indian Central Coconut Committee.

Agronomy

The Station is carrying out manurial trials with 20 palm plots on statistical lines of four soil types and single palm treatments have also been maintained for 35 years. It has been found that individual palms give different responses to manure due to age and type. For this reason yield data are being kept for every single palm in each plot to study the effect of manures on high, medium, and low yielders.

They are also carrying out cultivation trials,—heaping sandy soils, use of green manures and the retention of rain by low walls. The best shape, size and direction of planting holes is also being studied. There are also demonstrations of over-crowded planting, long-neglected cultivation (40 years) and poor seedlings and planting trials. Details of nursery technique have been exhaustively studied.

Two alternative crops,—casuarina and cashew, are also being studied as alternative crops for marginal lands.

Conclusion

We were most impressed by the enthusiasm of the Staff at both Stations and their intelligent approach to problems of research.

It is quite apparent however that both India and Ceylon would benefit by closer liason between the technical officers serving the coconut industry in these countries. It is recommended therefore that there should be an interchange of officers and periodical conferences promoted by joint action of the Indian Central Coconut Committee and the Coconut Research Board of Ceylon for technical officers.

During our visit to the Agricultural Research Institute at Coimbatore we found that the officers had almost completed their Administration Reports for 1953. This is remarkable as it was within five weeks of the end of 1953.

Apart from this, we were greatly struck by the form of the reports. Each report consisted of specific answers to a questionnaire a copy of which is given below. We would earnestly comment this system for the consideration of the Board and also of the Government, for the advantages cannot be over-estimated. Of course, a suitable questionnaire must be evolved in each case.

APPENDIX I

ITINERARY

Sunday, January 31st

Afternoon.—Inspection of coconut areas, south of Trivandrum.

Monday, February 1st

Morning.—Inspection of coconut areas, north of *Trivandrum* and near Quilon, and visits to cashew nut factories at Kuttayam with Dr. K. M. Pandalai.

Afternoon.—Visit to Coconut Research Station (Pests and Diseases) at *Kayangulam*. Discussions with staff, Dr. K. M. Pandalai (Soil Chemistry), Shri T. A. Davis (Plant Physiology), Shri K. K. Nirula (Entomology).

Evening.—Inspection of coconut areas, south of *Cochin*.

Tuesday, February 2nd

Morning.—Visit to Headquarters of the Indian Central Coconut Committee at *Ernakulam* thence to Coconut Demonstration Station (Department of Agriculture) and to a coir factory and coconut oil mills, in and near *Cochin*, with Shri K. Gopalan, Secretary, Indian Central Coconut Committee.

Afternoon.—Inspection of the layout of low-lying coconut areas, north of *Cochin* from the air, while *en route* to *Mangalore* and *Kasaragod*.

Wednesday, February 3rd

Morning.—Visit to Coconut Research Station at *Kasaragod.* Inspection of field experiments, coconut varieties, agri-meteorological station and also cashew and casuarina plantations with the Director. Discussions with Staff, Shri C. E. M. John (Director), Shri S. R. Gangolly (Cyto-Anatomist) and Shri E. J. Verghese (Chemistry).

Afternoon.—Address by the Director, Coconut Research Institute of Ceylon to the Study Circle of the Coconut Research Scheme, Kasaragod, followed by discussion.

Thursday, February 4th

En route from *Kasaragod* to *Coimbatore,* inspecting coconut areas along the Malabar Coast, near *Calicut.* Met by Shri C. R. Seshadri of the Agricultural College, and Research Institute, *Coimbatore.*

Friday, February 5th

Morning.—Visit to Agricultural College and Research Institute at *Coimbatore.* Discussions with the Principal, Shri R. Balasubramaniah and with members of the staff,—Shri C. R. Seshadri (Oilseeds Specialist), Shri O. Narasinghe Rao (Fruit Specialist), Shri Tirumula Rao (Entomology), Shri C. S. Krishnamoorthy (Pathology) and Shri N. Krishnaswami (Cyto-Genetics).

Afternoon.—Visit to plantation of Mr. G. D. Naidu to see irrigation of coconuts and other crops and results of special treatments of papaya, banana and cotton plants.

Saturday, February 6th

Morning.—Visit to Sugar Cane Research Station at Coimbatore (Plant Breeding).

Sunday, February 7th

Proceeded to Trichinopoly by night mail.

Monday, February 8th

Returned to Colombo by Air.

APPENDIX II

AGRICULTURAL RESEARCH INSTITUTE, COIMBATORE

Standard Form of Report on Specific Items of Research

1. What is the item of research programme and what is the objective ?
2. What is the venue and the date of commencement of work ?
3. Who are the principal persons engaged in the item of research ?
4. What was the work done under each item in the previous years ?
5. What is the work done during the period under review ?
6. What is the tangible result achieved during the period under review, and how has it progressed since research done on the item previously ?
7. Are the results in the laboratory stage, trial plot stage or demonstration stage ?
8. Have the results been put across to the ryots for adoption ?
9. Have the ryots adopted the method on their fields, and if so, with what benefit ?
10. What will it cost the cultivator to adopt the results ?
11. If the research has produced results have they been transmitted to the field staff for " extension work " and, if so, what steps have been taken ?
12. Have the persons engaged in the research or the Head of Section published the results in any scientific Journal ?
13. Is it proposed to continue the items of research or to give it up and if the latter, why ?
14. What is your (Research Officer's) opinion of the value of the work done ?

* * * * *

1. A Programme of Research is drawn up for each Department covering a period of years.
2. The Annual Report takes the form of reply to a separate itemised questionnaire on each item of research, in the Programme.
3. It does not follow that all questions can or need be answered. In such cases the reply is " does not arise " or " not known."