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Reprint from Coconut Bulletin, Vol. XIV, No. 5
August 1960, Pages 129 — 136

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THE INTERNATIONAL APPROACH TO COCONUT IMPROVEMENT

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Food and Agricultural Organisation of the United Nations

M. T. M. Press, Ltd., Ernakulam

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The Coconut Improvement Problem

IN favourable conditions of soil, rainfall, management and health, an acre of tall coconut palms is capable of producing 4,500 to 5,000 nuts, or about one long ton of copra, a year for at least 35 years, from the 15th to the 50th year. In some areas and on some plantations, such yields are obtained up to the 60th year and yields of 6,000 nuts per acre per annum also have been reliably reported. Yet the highest country averages seldom exceed 2,000 nuts per acre per annum and are more frequently about half that number. It is also

reported that in some parts of the world, tall plantation palms which, presumably, are genetically similar to those in other parts, become senile and uneconomic when they are 45 years old. What are the reasons for these very wide variations?

The number of nuts of tall plantation palms required to produce one long ton of copra (copra out-turn) is said to be 4,500 in the Philippines, 4,800 in Ceylon, and 6,000 to 8,000 in South India and the Pacific. Similar variations exist within countries. How are these differences to be accounted for? It is true that the copra out-turn of the San Ramon variety of the Philippines and certain other tall forms in other parts of the world is 2,800 to 3,300 and of dwarf palms and a few tall forms with very small nuts, 8,400 to 10,000. But plantation populations are genetically mixed talls, and more or less the same type of mixture prevails in all parts of the world, certainly in South India and Ceylon. Therefore, the principal reasons for dissimilarity in nut-size is likely to be other than genetic.

Varying Incidence of Black Beetle

From a global stand-point, coconut is less affected by pests and diseases than most other tree crops, but if we take each country in turn the picture is very different. Thus, while *Oryctes rhinoceros*, the coconut rhinoceros or black beetle, has been present in India, Burma, Ceylon, and other countries in Asia and the Far East for a very long time, it is certainly not the principal cause of the low coconut yields in these countries, nor is it regarded as a serious threat to the existence of their coconut industries. Yet the same insect, accidentally introduced into the Palau Group of the Western Caroline Islands around 1942, has devastated coconut holdings there and continues to frustrate attempts to replant the crop, in spite of the application of mechanical and biological control measures throughout a period of ten years. In Samoa and Wallis Island, to which also the beetle was accidentally introduced some fifty years ago, very serious damage to palms has eventuated, though not to the same extent as in the Palaus. In the Fijian Group, which suffered an invasion around 1952, the beetle has been kept confined to the minor coconut producing island of Viti Levu, where its activities have been mild. What are the reasons for these variations in destructiveness of the insect? Are they mainly natural and biological or traceable to good plantation hygiene and the destruction of breeding sites? What is it that prevents the beetle's getting out of hand in the older coconut countries? What were the reasons for the spectacular control, in a matter of three or four years in the late 1920's of *Levuana iridescens* in Fiji by *Ptychomyia remota*, a parasite of an allied insect, introduced from Malaya and, by contrast, the painfully slow establishment and multiplication of *Scolia ruficornis*, a larval parasite of a number of species of *Oryctes*, which was introduced into Samoa from Zanzibar in 1945 and repeatedly into the Palau islands from East Africa and Zanzibar from 1947 to 1951? How are we to put to practical account the recent observation that

Heidenreich's Disease and Maya's Disease are lethal to *Oryctes rhinoceros* in natural conditions?

Other Pests

What is the best mode of detection and extermination of the larvae of *Rhynchophorus ferrugineus* and *R. schach*, which hatch out and operate in concealment within the trunks of palms? These weevils are a menace to young coconut plantations, but after fifty years of study baffle control. And how can we, within economic limits, devise effective and continuous measures of prevention and control of such localized, but very virulent, pests as *Artona catoxantha* in Malaya, Indonesia and Borneo, *Nephantis serinopa* in India, Burma and Ceylon, *Amblypelta cocophaga* in the Solomon Islands, *Melittomma insulare* in the Seychelles and Madagascar, *Setora nitens* in Borneo, and *Aphelenchoides cocophilus* in South and Central America and the West Indies, and, even more important, what line of action, other than quarantine, which is purely defensive, should be taken as an insurance against invasion by countries that are now free from these and other pests?

Baffling Diseases

What are the basic causes of the serious maladies which lead to debility, barrenness and death, known respectively as Cadang-Cadang (Dying-Dying) in the Philippines, Root (Wilt) Diseases in South India, Kaincope (Cape St. Paul's Wilt) in West Africa, Unknown Disease (Lethal Yellowing), Little Leaf and Pencil Point in the West Indies, Bronze Leaf Wilt in Trinidad, Head Droop, Cork Screw, Cabbage Droop and Strangle Disease in New Guinea and the Bismarck Archipelago, Frond Choke and Maturation Wilt in New Guinea, and Tapering Stem in Ceylon and elsewhere? Entomologists, plant pathologists, virologists, soil chemists and plant chemists in the various countries mentioned have carried out separate investigations on these conditions for many years, but with little success in finding causes, effective measures of prevention or cures.

What is the state of our knowledge on the morphology, physiology, biochemistry, metabolism and nutritive requirements of the coconut palm? Do we know enough about the palm in health, in order to be able to assist those who are concerned with the palm in disease?

Classification of Varieties

The genus *Cocos*. L. is monotypic, but the single species, *C. nucifera*, is widely varying. It is divisible into two broad groups, tall and dwarf, which are very different from each other in certain important characters such as length of stem at flowering and full maturity, girth of stem, dimensions of leaf and leaflets, duration of the period between germination of the seed and flowering of the palm, duration of male and female phases of the androgynous inflorescence, percentage of sugar in the sap, duration of life, productivity, and resistance to environmental variations, pests and, possibly, diseases. Further, tall coconut palms are cross-pollinating and therefore, heterozygous, and dwarf palms are almost completely self-pollinating and, therefore, nearly homozygous. Within each of these two groups, which may, perhaps, be

regarded as sub-species, there are variations, classifiable as varieties, sub-varieties and forms, distinguishable by the colour of the epidermis of the husk before it begins to dry, the colour of the internal tissues of the husk, the colour of the midrib of the leaf, the physical consistency of the ripe kernel, the number of inflorescences or bunches of nuts produced in a year, size and shape of nut in the husk and in the shell, sugar content of the immature husk, thickness of kernel, productivity as expressed in terms of the number of nuts or the weight of kernel produced in a year, and susceptibility to pests and diseases. Tall palms are more variable than dwarf palms. At any rate, more variations have been noted among talls than among dwarfs. But it is very likely that every variation among talls will eventually be found among dwarfs also.

Many such variations furnish valuable material for selection and breeding, but, unfortunately, it has not been possible hitherto to carry out a well-planned taxonomic survey of coconut varieties, sub-varieties and forms, involving fundamental cytological studies also, owing to the extremely difficult nature of the problem and the inability of individual countries to finance and man an investigation, which would have to include surveys in all countries within the belt bounded by the Tropics of Cancer and Capricorn and require the services of a number of specialists. Attempts at classification so far made have been concerned with only a fraction of the total available material and have in most cases been rather misleading. Abnormalities, forms and geographic types have been elevated to varietal status and given Latin and other names with scanty descriptions or no descriptions at all. It will, therefore, be of interest to all concerned in the genetic improvement of coconut to learn that at least one region is to be subjected to a comprehensive, multi-national taxonomic survey in the near future, namely, that portion of the Pacific within the scope of the South Pacific Commission.

Little Scientific Attention

In his "Dictionary of the Economic Products of the Malay Peninsula", I. H. Burkill states "The coconut palm is one of Nature's greatest gifts to man. Nature gave it to him ready made, whereas whatever excellence is possessed by most of his other important food-plants has been his reward after ages of semiconscious effort to ennoble them by selection. It is true that he now possesses a number of partially isolated races of the coconut, and that he has obtained a few relatively dwarf and slightly precocious races, so that he reaps a crop with reduced trouble, but this is little to his credit as an agriculturist."

This statement was published in 1935 and is, of course, a little too harsh. While it is likely that the coconut was largely dispersed by ocean currents from its original home to neighbouring countries, it is incontrovertible that in quite ancient times man himself conveyed this valuable fruit from place to place in his short travels and longer migrations and, when doing so, he must have exercised some selection of his future planting material. Once having established it in its new home, he must have also to some extent selected for more extended planting the better types from his first and subsequent generations of palms. On one occasion

the world, devoted exclusively to investigations on coconut, namely, the Coconut Research Institute of Ceylon, is not quite thirty years old, while the two next oldest, in India, have not been in full working order for more than twelve years. It is true that very valuable studies, especially on pests and diseases, had been initiated earlier in many countries in both hemispheres, but having been concerned with urgent or day to day problems they have lacked continuity. For the most part, such investigations have been carried out by officers of Departments of Agriculture dealing with a number of economic crops, some of which, like rice, rubber, tea and cocoa, have always attracted more attention than coconut.

Need for International Action

The total world area under coconut is about eight and a half million acres and therefore, the largest under any tropical perennial crop except coffee. More than ninety per cent. of that area are in the countries of Asia, the Far East and the South Pacific, the Philippines, India, Indonesia and Ceylon accounting for nearly eighty per cent. of the total world acreage and 85 per cent. of total production. It is, therefore, not surprising that the countries of this region, with their rapidly expanding populations and rising standards of living, should have come to realize that it is necessary not only to intensify coconut research within countries, but also to co-operate with each other in the solution of technical problems of production, protection and processing and matters relating to trade in coconut products.

The South Pacific Commission had already initiated action on these lines in 1952 and engaged the writer to examine the coconut production situation in the territories within its scope and the possibility of establishing internationally coordinated research for the improvement of coconut production in the high and low islands and atolls of the Pacific. The recommendation was made that a single coconut research institute to serve all types of islands in the region would not be useful, but that problems common to each type, especially those of a fundamental nature, could be very profitably studied at two centres, one for high islands and the other for atolls and low islands. The second part of this recommendation has been implemented and an atoll coconut research station set up on Rangiroa, partly financed by the South Pacific Commission.

International Conferences

The first notable step towards international co-operation in coconut research was, however, taken at the Eighth Pacific Science Congress held in Manila in November, 1953, when it was recommended that all coconut producing countries in the Pacific region should co-operate and coordinate efforts to collect all the varieties and forms of coconut in the world and that FAO be requested to assist.

In August, 1955, the First International Coconut Conference, attended by delegates from India, Indonesia, Ceylon and the Philippines, the four largest coconut producing countries in the world, was held in Manila and it was decided on representations made by the Philippines that FAO be requested to carry out a survey of coconut acreage,

production and marketing and to undertake "a coordinated research program among the coconut producing countries of the region". The Conference also decided to set up, among other fact-finding Committees, a Committee "to examine the problems requiring research and to study the ways and means of investigating common research problems and bringing about liaison between the national research institutions engaged in coconut research and exchanging experts and technical personnel between the individual coconut producing countries".

Catalogue of Genetic Stocks

The importance of the recommendation of the Eighth Pacific Science Congress was accepted by the FAO Conference at its Eighth Session, November, 1955, as follows :

> "The Conference recognized the contribution that the FAO World Catalogues of Genetic Stocks of Wheat and Rice are making to plant introduction and plant breeding programs and noted the projected catalogue of coconut varieties. In this connection, it suggested that, in view of the contribution that wild species can make to varietal improvement programs, this catalogue should cover the genus *Cocos*."

Acting on this Resolution, the Plant Production and Protection Division of FAO initiated a preliminary world survey by distributing to all coconut growing countries a questionnaire requesting such information as would lead to a clarification of the taxonomy of coconut varieties and forms. In early 1959, the replies received were summarised in the form of a list with descriptive details and distributed to countries, but the net result of the survey was the revelation that basic botanical and other information on variations within the species *C. nucifera* was very scanty and of limited value for taxonomic purposes. It was clear that here was a field in which much more coordinated research was required, without which the improvement of the palm through selection and breeding could not be properly handled.

Economic Study Group

The FAO Conference of November, 1955 also viewed with favour the request made at the First International Coconut Conference for a statistical and economic survey on area, production and marketing and adopted the following Resolution (No. 11/55) :

> The Conference
>
> *Having taken note* of the request of the Philippines which is substantially interested in the production and consumption of and trade in coconut and coconut products for the establishment of a CCP (Committee on Commodity Problems) group to consider questions of international trade in those commodities, with special reference to possible measures for counteracting excessive fluctuations in prices and quantities traded;
>
> *Bearing in mind* the procedures followed by FAO on these matters, and in particular also the views expressed by ICCICA (Interim

Coordinating Committee for International Commodity Arrangements) and endorsed by the Conference on the useful functions that can be performed by commodity study groups on which all interested governments can be represented;

Requests the CCP to establish at an early date, as may be desirable, a group on coconut and coconut products, and to take the necessary preparatory steps, in conjunction with the Director-General, for the organization of the work of that group.

In May, 1956, a report on "Some Aspects of the Coconut Situation" was issued by the Fats and Oils Section of the Economics Division of FAO and, on the strength of that report, at the Twenty-Seventh Session of the FAO Committee on Commodity Problems, held in June, 1956, an *ad hoc* Working Party on Coconut and Coconut Products was set up to make a preliminary examination of:

"1) the main difficulties of the world coconut economy;

2) the need for mprovement in statistics and other basic economic data on coconut production, trade and consumption;

3) whether it is desirable to establish a special CCP study group on coconut products;

and to report its findings and recommendations to the next session of this Committee."

Australia, Ceylon, France, India, Indonesia, Philippines, United Kingdom and United States accepted membership in the Working Party and their representatives attended a meeting held in Colombo in January, 1957, supported by observers from Germany, Italy, the Netherlands and Pakistan, the United Nations and the U. N. Economic Commission for Asia and the Far East. Among the papers tabled was a statement prepared by the Agriculture Division of FAO on "Technical aspects and problems of coconut production and processing" and the Working Party, while reporting on economic aspects, also devoted some time to certain technical questions of coconut production, protection and processing, which were of fundamental importance to economic considerations.

In March 1957, at its Twenty-Eighth Session, the FAO Committee on Commodity Problems decided to establish an intergovernmental Study Group on Coconut and Coconut Products and agreed that the Group "should concern itself with the economic aspects of production, consumption, trade and marketing of coconut and coconut products, including quality questions, the study of the causes and effects of fluctuations in the price and volume of international trade; and should generally consider measures to promote a steady expansion of consumption and production of coconut products." The Group was, at the same time, to maintain close liaison with other bodies concerned with coconut problems.

Technical Problems

Thus, a very important and far-reaching step was taken by FAO to meet

the urgent needs of coconut growing countries in Asia and the Far East in the economic field, leaving similar action in the technical field for later consideration. However, at the very first Session of the Group on Coconut and Coconut Products, held at FAO Headquarters, Rome, from 25 November to 3 December, 1957, a number of technical production problems also had to be discussed and a Technical Sub-Group, with the Tropical Crops Specialist of the FAO Plant Production and Protection Division acting as Secretary, was appointed to examine and report upon them. The Sub-Group's report contained recommendations on a world survey of plant material, exchange of plant material, world survey and study of pests and diseases, fundamental coconut research and the establishment of an International Coconut Bureau, and at the Plenary Session of the Group the following resolution was unanimously adopted:

"The FAO Group on Coconut and Coconut Products:

Considering that the economic improvement of coconut agriculture is seriously handicapped by lack of scientific and technical knowledge, to an extent greater than that for other world crops of comparable importance, and

Emphasizing that the advancement of such knowledge could be greatly aided through international cooperation,

Recommends the appointment of a highly qualified expert to assess the status of research being carried out in different countries, to start work on the collection, organization, and exchange of technical and scientific information and to make a preliminary study concerning the structure and functions of a proposed International Coconut Bureau, and

Requests the Director-General of FAO to provide the necessary funds under the Expanded Technical Assistance Program for the recruitment and work of this expert, and

Recommends to the governments of coconut producing countries that they take the necessary steps to request the appointment of this expert for the prosecution of this work."

Member Governments of the Group, whose representatives voted on this resolution, were Australia, Burma, Ceylon, France, Western Germany, India, Indonesia, Italy, Japan, Malaya, Netherlands, Norway, Philippines, Thailand, United Kingdom and United States.

FAO Regional Coconut Improvement Project

Although within two months of the adoption of this resolution and the issue of the report of the First Session of the Group on Coconut and Coconut Products on 3 December, 1957, the Plant Production and Protection Division of FAO had commenced enquiries for an expert, it was not found possible to make the appointment in 1958 owing to the

unavailability in that year of funds under the Expanded Technical Assistance Programme (ETAP). But at the earliest possible opportunity, in January, 1959, the appointment was made and the FAO Regional Coconut Improvement Project came into being under the Plant Production and Protection Division. A second important step was thus taken by FAO to meet the needs of coconut growing countries in Asia and the Far East and it may be said that there is now good hope of progress in international co-operation in the solution of both economic and technical problems of coconut production, protection and processing.

Production of Quality Copra

In the field of processing, FAO published an Agricultural Development Paper, No. 63 of 1958, on "Copra Processing in Rural Industries", which contains a wealth of useful information on various types of copra driers and processing techniques for the production of first quality copra. Previously, the South Pacific Commission had published a Technical Paper, No. 82 of 1955, on "The manufacture of Copra in the Pacific Islands", which provided similar information. Armed with these two papers, every coconut grower in the world should be able to produce clean, white, sweet-smelling copra with six per cent. moisture and less than one per cent. free fatty acids and thus meet the most stringent present demands of oil millers in any country in the world. If he is now not producing copra of such quality, it is not because there is no information on the subject, but due to his failure to apply the knowledge which has been in existence for more than twenty years. It may, in fact, be said that improvement of copra is not, at the moment, a matter for research but for agricultural education and extension.

This does not mean that there is no scope for research. On the contrary, the best copra driers still have their defects and there is need for much more experimentation, again preferably, on an international basis, on design, constructional materials, fuel, conservation of heat, continuity of firing precedures, economy of drying time and economy of labour. Countries have, therefore, appealed to FAO to appoint a processing expert for a two-year period, but action has been delayed by the inadequacy of response to a request made by the Director-General for group-country participation in financing the appointment.

Handling of Technical Problem

In the absence of an intergovernmental body set up by FAO for the exclusive purpose of dealing with technical problems of coconut production, protection and processing, the Group on Coconut and Coconut Products, under the guidance of the Economics Division of FAO and acting in close co-operation with the Plant Production and Protection Division, has continued to handle technical problems also and at the Group's Second Session, held in Manila in October, 1958, its Technical Sub-Committee submitted a report, which embodied a brief statement on coconut research in progress in Papua, Australian New Guinea, Ceylon, Indonesia, Malaya, Philippines and British Colonial Territories, and the minutes of discussions on improvement of yields by management practices, selection and breeding, and

control of pests and diseases, notably cadang-cadang and other wilt diseases and *Oryctes rhinoceros*. This report, which has been widely circulated, conveys in a nutshell some of the technical problems of common concern to coconut growing countries in all parts of the world and reiterates the need for international co-operation in the search for solutions.

It will be noted that in the five years, from November, 1953 to the end of 1958, various requests for action in the technical field have been made to FAO by coconut growing countries in Asia and the Far East and Australian, British and French territories in the South Pacific. All these requests have been written into the following terms of reference of the FAO Regional Agricultural Officer (Coconut Improvement):

"(a) To make a general survey of the present situation of coconut production in Ceylon, India, Burma, Thailand, Pakistan, Cambodia, Viet-Nam, Malaya, Indonesia, Sarawak, North Borneo, Philippines, Papua and New Guinea and certain islands in the South Pacific, with special emphasis on technical production problems;

"(b) to evaluate past and present activities with regard to coconut research and extension in the areas mentioned in (a);

"(c) to suggest specific research problems which could be better solved through international co-operation;

"(d) to advise and assist governments in the improvement of the efficiency of coconut production through personal visits and correspondence;

"(e) to study the possibility of establishing an international centre for the coordination of research and other matters, as well as for the rapid dissemination of technical information on coconut".

The development of the FAO Regional Coconut Improvement Project

The Regional Agricultural Officer (Coconut Improvement) was appointed under the FAO Expanded Technical Assistance Program on 26 January, 1959, and has now visited all countries in Asia and the Far East mentioned in his terms of reference and also Netherlands New Guinea, at the special request of the Government of the Netherlands. Australian, British and French territories in the West and South Pacific, with which he is already very familiar as a result of tours performed in 1952-1954 while attached to the South Pacific Commission, will be visited in 1961 and in the same year a visit will be paid to Tonga by special request of the Government of that Kingdom.

The tours already performed have enabled him to collect very complete information on the technical problems of coconut production and protection peculiar to each country, assess in detail the status of coconut research and extension and, in consultation with technical personnel in each country, arrive at an understanding of the research problems which could be solved with greater economy of men, money and

materials through coordinated and co-operative international than separate national action. Such personal visits have also provided opportunities for on-the-spot technical advice and exchange of information, subsequently amplified through correspondence, distribution of technical and advisory literature and other forms of assistance. It is also noteworthy that during his tour in India the officer had the good fortune to meet and consult Professor J. B. S. Haldane of the Indian Statistical Institute, Calcutta, who has shown much interest in coconut genetics and recently advised the Indian Central Coconut Committee on a coconut breeding program for the Central Coconut Research Station, Kasaragod, and Dr. D. Chatterjee, the well-known taxonomist, formerly of the Royal Botanic Gardens, Kew, and now Superintendent of the Indian Botanic Garden, Calcutta, who has expressed a willingness to assist in the classification of coconut varieties and forms.

In March, 1960, Viet-Nam was revisited for special consultations on the possibility of establishing a coconut research and extension service in that country and before the end of the year certain other countries, including Ceylon, India, East Pakistan and Burma, will also be revisited.

Requests for Technical Assistance

Among examples of technical assistance requested by and in some cases rendered to countries the following may be cited:

a) At the request of the Director, Central Coconut Research Station, Kayangulam, South India, FAO was instrumental in obtaining from the Director of the South African Museum, Cape Town, a small quantity of seed of *Jubaeopsis caffra* Becc., an interesting African species indigenous to Pondoland and allied to *Cocos nucifera* L., for the purpose of attempting an inter-generic cross.

b) The Joint Director, Central Coconut Research Station, Kasaragod, South India, has sought FAO's assistance to procure certain rare chemicals and hormones for physiological and nutritional studies on coconut. In this instance, FAO has not been able to render effective help, but, since such studies are of fundamental importance to the region, the request is commended to all countries interested in coconut production, especially the metropolitan consumer countries.

c) India and Malaya wish to obtain breeding material of the wasp, *Scolia ruficornis*, a parasite of *Oryctes* spp. in East Africa and Zanzibar, which is now reputed to be well established in the Palau Islands, Western Caroline Islands, Trust Territory of the Pacific Islands. The request has been directed to the Staff Entomologist of the Trust Territory for favourable consideration.

d) The control of *Nephantis serinopa* is of special importance to coconut growers in India, Burma and Ceylon and favourable results have been obtained already through the employment of a number of larval and pupal parasites. The Entomologist of the Central Coconut Research Station, Kayangulam, is extending his investigations on the biological control of the pest and wishes to have for trial breeding material of *Ptychomyia remota*, the Tachinid parasite of *Artona*

catoxantha in Malaya, which was used with such spectacular success in the control of *Levuana iridescens* in Fiji in the late 1920's.

e) A number of requests have been received for seednuts of coconut varieties and forms for use in breeding programs, the latest and most important having come from the Director, Bureau of Plant Industry, Manila, Philippines, for planting material from all parts of the world for the purpose of testing them for resistance to cadang-cadang disease. A special effort is being made to meet this last request and FAO has sent out an appeal to all coconut growing countries in both hemispheres to assist in this important undertaking. The response has been most generous and offers of help have come from West Bengal, Thailand, Viet-Nam, Netherlands, New Guinea, British Guiana, British Honduras, Ivory Coast, Nigeria and Tanganyika. Trinidad (West Indies), while expressing willingness to help, has advised against obtaining seednuts from that island owing to the presence there of Red Ring disease caused by the nematode *Aphelenchoides cocophilus*. Offers of co-operation have also been received from the Secretary of the Indian Central Coconut Committee, the Director and Joint Director of the Central Coconut Research Stations at Kayangulam and Kasaragod and the Executive Officer for Economic Development of the South Pacific Commission.

f) A number of countries contemplating the establishment of coconut research and extension stations have asked for advice on laboratory design and equipment, land area for experimentations, staff structure, hiring of personnel, setting up of research programs etc.

g) Certain countries and individual States within countries are in urgent need of large quantities of seed coconuts for land development schemes and, in one instance, FAO was approached for assistance in obtaining 80,000 seednuts. Two countries were approached, but in one case there was no selected planting material available for its own needs and, in the other, local new planting and replanting programs were so extensive that even a very considerable domestic supply was found to be insufficient to meet the requirements.

In India, the largest source of supply of selected seednuts is Kerala and all other States have so far depended on it for their rehabilitation and new planting schemes. In Ceylon, the demand so greatly exceeds the supply of high quality seednuts that it has been found necessary, until seed-palm selection is expanded, to use seednuts of less good quality. In the coconut growing States of India, other than Kerala, East Pakistan, Malaya, Indonesia, the Philippines, Cambodia, Thailand, Viet-Nam, Sarawak, North Borneo and Netherlands New Guinea, seed-palm selection on a large scale has not been started yet, although in all these territories excellent forms of coconut are present.

It will therefore be of very great international advantage for each of these countries to commence building up a seed-palm pool immediately so that all countries may be able to draw upon the joint supply. It is also plain that each country or State should utilize to the full its own seednut resources before applying

to another country, although it must be admitted that in some countries trained personnel for seed selection are lacking. It goes without saying that seed-palms should not be selected in diseased or pest-ridden areas, except for very special purposes such as controlled experiments on disease resistance.

h) A bibliographic service has been initiated and a coconut reference library and directory of coconut research workers are in process of formation at the FAO Regional Office in Bangkok, and requests for literature and technical advice are beginning to come in.

International Coconut Bureau: Coordination of Research

Consultations made by the FAO Regional Agricultural Officer (Coconut Improvement) during his tours in the region show that, while the idea of an International Coconut Research Institute is viewed with universal disfavour, all countries participating in the Project are agreed that the establishment of an International Coconut Bureau "for the coordination of research and other matters, as well as for the rapid dissemination of technical information on coconut" will be of value to the whole region. The consensus of opinion is that the Bureau should be made responsible for coordination of international action in the following fields:

Fundamental research on the genetics of coconut, with a view to the production of high-yielding forms, which are resistant to diseases and pests, drought, excessive soil-water and salinity.

A taxonomic survey of varieties and forms of coconut on a world scale.

Fundamental research on the botany and physiology of the palm, the biochemistry of the nut from fertilization of the female flower to the ripening of the nut, and the biochemistry of germination.

Research on the nutrition of the palm at all ages and in relation to its genetic variations and variations of the environment.

Research on the aetiology and control of coconut diseases, especially the obscure wilt diseases which are of immediate concern to the Philippines, India, West Africa and the West Indies and which constitute a serious threat to other countries within and without Asia and the Far East. This matter has been emphasized in the following words in the report of the Third Session of the FAO Group on Coconut and Coconut Products:

> "The Group was unanimously of the opinion that, in the circumstances of the present and prospective supply situation, priority attention in technical activities ought to be given to questions of research on the nature and control of diseases and pests, in particular the four major diseases of unknown cause and method of transmission (Cadang-cadang, Lethal Yellowing (Unknown Disease), Cape St. Paul Wilt (Kaincope) and Root Rot or Wilt Disease). The disease of this nature which was presently causing the most serious damage and having the most serious effect on the

market, and which if not checked threatened to wipe out the Philippine coconut industry, was Cadang-cadang disease. This is at present confined to the Philippines but poses a major quarantine problem to adjacent coconut producing areas."

Collection, exchange and supply of coconut varieties and forms represented in all parts of the world and establishment and maintenance of living collections or type specimens in a number of agreed locations for the purpose of further taxonomic, genetic and other studies.

Promotion and facilitation of the exchange and supply of biological parasites, establishment of a centre for their breeding and distribution, and notification to countries of world insect collecting expeditions.

Advice on stocks of rare chemicals and hormones present at research institutes in the region and facilitation of their exchange and supply for nutritional and physiological investigations.

Technological and chemical engineering research with a view to improvement of copra quality and the better utilization of the coconut kernel and its components and other products of the palm and the expansion of the industrial uses of coconut products.

Interchange of research personnel.

Establishment and maintenance of a service for dissemination and exchange of technical and scientific information, promotion of contacts between research workers, and preparation and maintenance of bibliographies.

The New FAO Technical Working Party

An event of special interest to countries participating in the FAO Regional Coconut Improvement Project has been the adoption of the following Resolution (No. 38/59) by the Tenth FAO Conference held in Rome in October, 1959 :

"The Conference

Considering the great importance of the coconut as a cash and subsistance crop, primarily in South East Asia and the Pacific Islands,

Noting the increased interest shown by several member governments in the solution of technical problems of production and processing through coordinated joint action,

Supports the establishment of an FAO Technical Working Party on Coconut Production, Protection and Processing."

In terms of this Resolution, the Director-General of FAO has invited "all governments interested in the production or protection of the coconut crop and/or in the processing of its products to join the proposed Working Party and to nominate specialists who will promote its activities in association with the officers primarily concerned in FAO Headquarters and in the regions," and stated that the Working Party will be an informal body "designed to promote the interchange of experience among specialists, either by correspondence or at periodical meetings and seminars, and to

facilitate the initiation and conduct of co-operative experiments on problems of common interest."

The establishment of this Technical Working Party will provide coconut growing countries with a single and separate forum for consideration of technical problems of common concern and enable FAO to give them continuous assistance in the technical field as it is doing in the economic field through the Group on Coconut and Coconut Products. The Technical Working Party and the Group on Coconut and Coconut Products will naturally work in the closest co-operation with each other within the framework of FAO.

Coconut Statistics

Coconut being almost entirely in the hands of small producers, the collection of acreage, production and other statistics has always presented special difficulties, and returns made by countries have not always had the desired accuracy for crop forecasting and the evaluation of longer term production trends. There has also been no common methodology in the collection of country statistics. In order to meet this situation, FAO has recently appointed a Regional Coconut Statistician for Asia and the Far East,

> "To advise and assist the principal coconut producing countries in planning and conducting surveys for the development of suitable techniques and the methods for the estimation of coconut production, with particular emphasis on production of small holdings."

Present International Set-Up

It will now be seen that in response to requests made by coconut growing countries FAO has set up the following consultative and advisory bodies:

Under the Economics Division

> Group on Coconut and Coconut Products.
>
> Working Party on Copra Quality and Grading.
>
> Regional Coconut Statistics Project.

Under the Plant Production and Protection Division

> Regional Coconut Improvement Project.
>
> Technical Working Party on Coconut Production, Protection and Processing.
>
> (Coconut quarantine, which is of special importance at the present time, is within the scope of the FAO Regional Agricultural Officer (Plant Protection).)

Assistance under the FAO Expanded Technical Assistance Program has been given on request to individual coconut growing countries also. Cadang-cadang research has been assisted since January 1955 by the assignment to the Philippines of a sequence of four virus experts and, in March, 1960, a coconut officer was assigned to Indonesia for a period of one year.