

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE KASARAGOD

M.K. Nair and A.R.S. Menon

History

The Central Plantation Crops Research Institute came into being in 1970 when the ICAR merged the erstwhile two Central Coconut Research Stations at Kayangulam and Kasaragod and the Central Arecanut Research Station at Vittal along with its five Regional Centres at Palode, Kannara, Hirehalli, Kahikuchi and Mohitnagar. In the same year, a new Research Station was established at Sipighat, Andamans to take up research on plantation crops in the Union Territory. Two seed Farms were established at Kidu and Shantigodu in Karnataka during 1972 and 1973 respectively. In 1974, the **Ap-pangala** Centre in Karnataka was transferred from IIHR to CPCRI to undertake research on Cardamon. A Regional Station was set up at Calicut during 1975 with its research farm at Peruvannamuzhi (Calicut Dist.) to take up research on Spices. In 1975, the management and control of two ICAR Research Complexes in Goa and Lakshdweep were transferred to CPCRI.

The Research Centre at Sipighat was transferred to the Central Agricultural Research Institute during 1982 and in the same year a World Coconut **Germplasm** Centre was established by CPCRI at Sipighat.

Towards the end of VII Five Year Plan, the research on Spices and Cashew were delinked from CPCRI with the establishment of the National Research Centres for these crops. The ICAR Research Complex, Goa became an independent Institute in April, 1989 and ICAR Research Complex, Lakshadweep

was merged with CARI, Port Blair in October, 1989. Thus CPCRI has at present two Regional Stations (Vittal and Kayangulam), five Research Centres (Kannara, Palode, Hirehalli, Kahikuchi and Mohitnagar), a Seed **Farm** (Kidu) and World Coconut Germplasm Centre (Sipighat).

Mandate and approach

CPCRI was established with the following objectives:

- Development of appropriate production, protection and processing technologies for plantation crops through basic and applied research;
- Collection, conservation, cataloguing and evaluation of germplasm;
- Production of parental lines and breeders' stock;
- Economic evaluation of new technologies;
- Co-ordination of the research on Plantation Crops being done by other institutions and agencies in India;
- Servicing the All India **Co-ordinated** Research Projects on Palms;
- Collection, collation and dissemination of information on plantation crops to all concerned; and
- Collaborating with commodity Boards and Developmental Agencies on technology transfer.

To achieve these objectives with respect to the four main crops, **viz.** Coconut, Arecanut, Cocoa and Oil Palm, the Institute has estab-

lished a network of laboratories and divisions at various Centres in **Agro-nomy**, Genetics and Plant **Breeding**, Bio-chemistry, Plant Pathology, Virology, Entomology, Microbiology, Technology, Agricultural Economics, Statistics and Agricultural Extension.

With the delinking of research on cashew and spices from CPCRI and parting with two ICAR Research Complexes, the Institute has a staff strength of **152 scientists** assisted by a team of 150 technical, 24 auxiliary, 111 administrative and 524 supporting staff at present. While the main source of funding for the Institute continues to be from the ICAR, the institute also received financial support from national and international agencies such as Department of Biotechnology, World Bank, etc. for some of the ad-hoc projects.

The identification and **formulation** of research projects is done during the Staff Research Council (SRC) meeting held every year. The projects are critically reviewed and decisions taken to close, continue or modify according to the progress achieved. New programmes presented and discussed and approved if they qualify in terms of national priorities. Presently research is being carried out on 80 sub projects clubbed together into 22 mega projects of multi-disciplinary nature. The progress in each project is monitored through frequent meetings convened by the **project** leader and Head of the **Division concerned** as well as through the quarterly reports submitted by the scientists against the flow chart prepared at the time of project formulations. The Project Monitoring

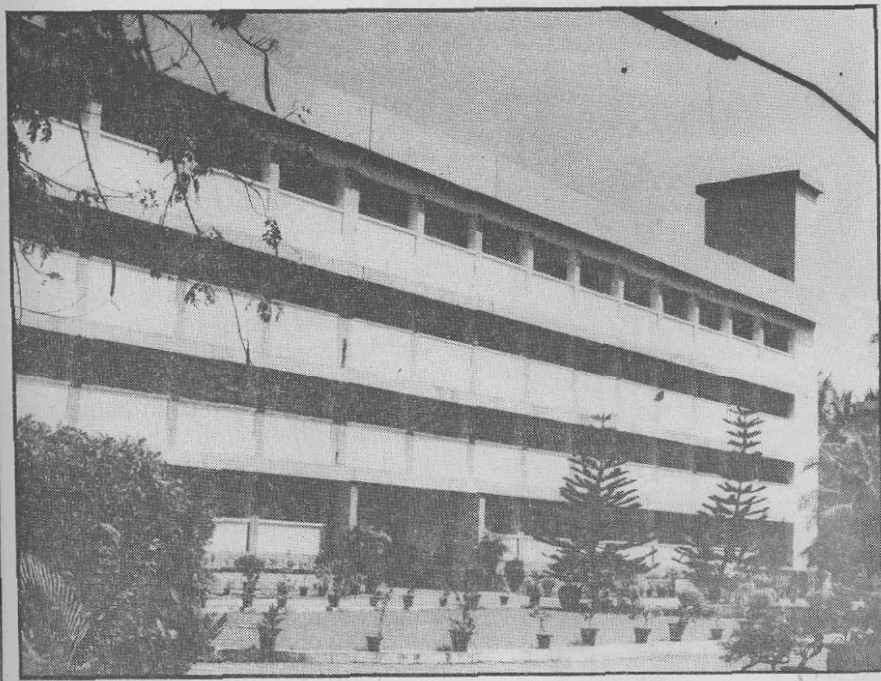


Fig.1 CPCRI Golden Jubilee Building

and Technical Cell (PMT) at the headquarters maintains the project files, compiles reports and takes follow up action for the implementation of the decisions taken during various review meetings. Some of the recent achievements of the Institute in Coconut research is described below.

Discovery of hybrid vigour and increasing productivity

Hybrid vigour in coconut was first discovered in 1932 and then exploited by the scientists at the erstwhile Central Coconut Research Station, Kasargod. They have established 2-3 times yield potential of Tall x Dwarf hybrids than either of their parents. In recent years, evaluation of yield performance of 87 hybrid combinations in coconut indicated the superiority of COD x WCT, LO x COD and WCT x COD under rainfed conditions, over the local cultivar WCT. These hybrids also showed less fluctuations in yield due to drought. In view of the superior performance of these hybrids the VIIth and IXth workshop of All

India Co-ordinated Research Project on Palms recommended the release of hybrids COD x WCT (Chandra Sankara), LO x COD (Chandra Laksha), WCT x COD (Kera Sankara), for cultivation in India.

CPCRI maintains the largest collection of coconut germplasm, comprising 86 exotic and 41 indigenous accessions. Newer hybrids involving all the available dwarfs and the more popular **talls** are being evolved and tested for their performance under different agro-climatic conditions. The national average yield of coconut is only 33 nuts per palm per year. Technology has been developed and demonstrated in farmer's field where the increase resulted in an average **annual** yield of 58 nuts per palm. With irrigation and manuring the annual yield could be **upto** 90 nuts per tree.

A simple hybridisation technique for commercial production of coconut hybrids was standardized by CPCRI. The technique involves emasculation of the male flowers before the female flowers come to **receptivity**, collection of **mature male flowers** from the selected **tall parents**, extracting the pollen grains after drying the crushed male flowers in oven at 40°C for 24 hours, diluting the pollen with neutral talc powder in 1:9 proportion and dusting the same using a pollen applicator.

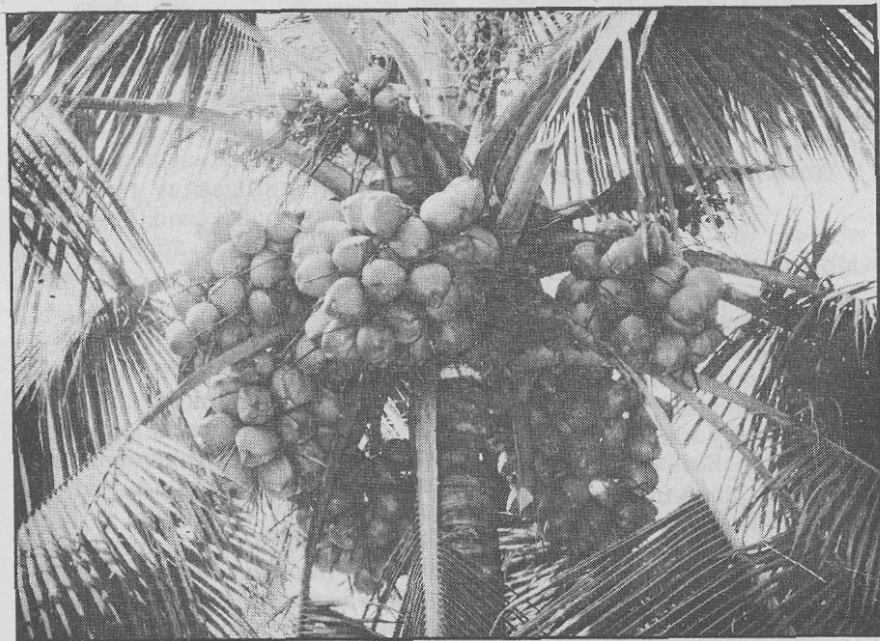


Fig.2 COD X WCT (Chandra Sankara)



Fig.3 Use of Pollen applicator for Hybridization

Soil Management and Nutrition

Addition of 50 kg of organics such as cow dust, forest leaves and cattle manure along with the recommended dose of NPK improved the initial growth and reduced the mortality of coconut seedling? from 50% to 17% in coastal sandy soil. In laterite soil, continuous application of rock phosphate for five years increased the nut yield by 77% as against an increase of 34% with superphosphate.

A plant density of 175 palms/ha at a spacing of 7.5 cm x 7.5 cm was found to be optimum. Slow release nitrogenous fertilizers were

found to be more efficient compared to straight nitrogenous fertilizers under heavy rainfall conditions since as high as 70% of the applied nitrogen gets lost in the latter case through leaching.

Water management

The drip irrigation technique developed for coconut gardens supplied the daily water need of 32 litres/palm in dry months at four dripping points located at one metre distance from the hole around the palm. The water is allowed to drip at about 30 cm below the soil surface at the rate of 2 litres/hr. This eliminates loss of nutrients by leaching. There

is about 40% saving of water than in basin system of irrigation. There is no weed growth, since surface remains dry thus appreciably reducing the cost of weeding.

Biological nitrogen fixation

Pueraria phaseoloides, *Calapogonium mucunoides* and *Mimosa invisa* were found to be most suitable legumes for cultivation in coconut basins from the point of view of nodulation, nitrogen contribution and biomass production. They contributed 15 to 20 kg of green matter per basin and about one third of the nitrogen requirement of the coconut palms when incorporated at four months growth stage.

Tree crops based cropping and farming systems

The diversified needs of farming community on one hand and the increased pressure on land to produce more from one unit area on the other led to the evolution of tree crop based high density cropping systems involving multispecies crops grown as different tiers in the interspaces of coconut and arecanut. To evolve highly productive crop models for different regions of the country, the Institute is conducting field experiments. The crops involved in these experiments are coconut, arecanut, cocoa, pepper, clove, nutmeg, mango, jack, sapota, guava, coffee, subabul, lime, banana, pineapple, papaya, tapioca, elephant foot yam, colacasia and fodder grasses.

The development of mixed farming and multistoreyed cropping systems in garden lands is also noteworthy. Under mixed farming, the interspaces in coconut and arecanut gardens are planted with fodder grasses and legumes; black pepper is trained on coconut and arecanut stems; banana or other fruit trees, tubers and vegetables are planted by the side of field bunds and foot-paths and cattle reared using the fodder

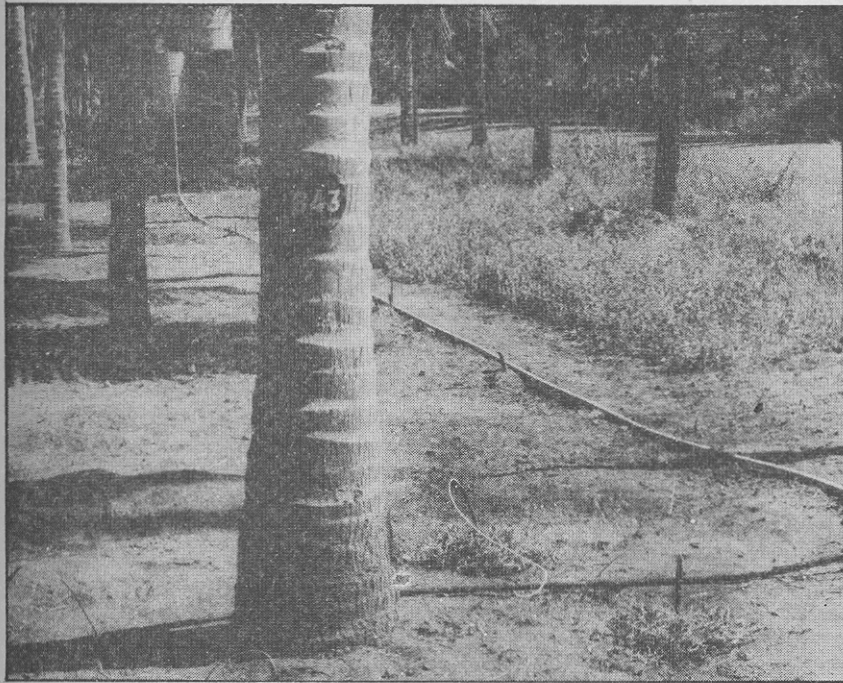


Fig.4 Drip Irrigation Technique

grass and legume as feed. One hectare of coconut garden can support four heads of cattle and their dung when cycled through a biogas plant produce gas adequate to meet the lighting and cooking needs of the farming family. The recycled dung thereafter was applied to the grass as manure. Under experimental conditions, one hectare of coconut garden under mixed farming can fetch a net income of Rs. 29,500/-.

Studies on the canopy size and root distribution of coconut and arecanut showed that in a fully grown garden more than three-fourths of the root system is concentrated with one-fourth of the total area of the garden and only 25-60% of the incident sunshine is intercepted by the coconut, arecanut during the different stages of growth. This indicated the possibility of utilising the vertical space more profitably. Keeping this in view, multistoreyed cropping system involving pineapple as the ground floor, cocoa or cinnamon as the first floor, black pepper trained on coconut or arecanut as the second floor and coconut or arecanut can-

opy at the top floor, was developed. Several variations of this scheme are now under trial. In addition to increasing the income by 50-125% from the same area of land, multistoreyed cropping increases the employment potential of garden lands by 2-3 fold depending on the crops grown.

Management of **root(wilt)** affected gardens

The coconut **root(wilt)** disease has been estimated to cause an annual production loss of nearly 968 million nuts in addition to loss in number of leaf, copra weight and oil content. At present the disease has spread contiguously to over one third of the area under coconut in the seven southern districts of Kerala from Trivandrum to Trichur with sporadic occurrences in the northern districts.

The notable achievement in the **root(wilt)** disease research programme is the identification of mycoplasma like organisms (MLOs)

in the phloem in the salivary glands and brain tissues of the lace wing bug (*Stephanitis typica*) subjected to an incubation period of 18-22 days. The lace bug has been proved to be an effective vector through transmission experiments.

An ambitious programme to contain the spread of the **root(wilt)** disease was launched in 1979 with the active co-operation of the Kerala Agricultural Department and KAU. Under this programme, all the diseased palms in the suspected border area of Trichur has been uprooted and destroyed. The CPCRI Field Station established in 1979 at Irinjalakuda and now merged with Kannara Centre is keeping continuous vigil on the recurrence of the disease in areas beyond north of Trichur. Efforts are underway in collaboration with the Directorate of Oil Seeds and the Agricultural University for similar operations in the neighbouring districts of Tamil Nadu.

The feasibility of gradually replacing the uneconomic palms in disease affected areas and replacement with less susceptible and high yielding DxT hybrid seedlings after treating pits with a combination of fungicide and nematicide is under investigation.

Other diseases and pests

(i) Thanjavur **wilt/Ganoderma** and Stem bleeding complex: Thielaviopsis paradoxa was proved to be causal agent of stem bleeding disease. In vitro screening showed that Carbendazim 100 ppm is fungicidal to the pathogen.

(ii) Leaf rot disease: A sequential schedule of application of fungicides comprising Bordeaux mixture (3%), Dithane M-45 (0.3%) and Fytolan (0.5%) applied in this order at monthly intervals after removing and destroying all the severely affected leaves has been found to control the disease.



Fig.5 Multistoried cropping system in coconut garden

(iii) **Rhinoceros beetle:** Biological control of this pest with Baculovirus infected *Oryctes* beetle was found to be successful.

Baculovirus was successfully introduced in Minicoy, Lakshadweep, in April 1983. This exerted substantial reduction in pest incidence and crop damage. Based on the success achieved in biological pest suppression of the pest, introduction of the virus to other islands also is attempted as a collaborative programme with the Directorate of Agriculture of Union Territory of Lakshadweep. Re-release of Baculovirus in the mainland in an already infected contiguous area also showed beneficial effects in reducing the pest population. This technology had already gone to the extension agencies for adoption.

(iv) **Leafeating caterpillar:** A sampling technique was developed to estimate the field population of *Opisina arenosella*. Among the indigenous natural enemies of *O. arenosella*, the pupal parasitoid *Brachymeria nosatoi* was found to be an efficient bio-control agent of the pest. The parasites are being mass multi-

plied and released. Dichlorvas 0.02% which is less harmful to many of the parasites is recommended as a substitute to BHC/Malathion for spraying.

(v) **Red Palm Weevil:** The incidence of this pest could be brought down to zero level from 7% by adopting an integrated method comprising mechanical, chemical and sanitational measures. An electronic device to detect red palm weevil infestation in the early stage itself was designed in collaboration with the College of Engineering, Trivandrum.

(vi) **Vertebrate pest:** The rat damage to tender coconuts could be completely controlled by the application of 10 g Bromadiolone (0.005%) baits on the crowns of palms two times at an interval of 12 days.

Tissue Culture

In first reported success in tissue culture of coconut from the CPCRI laboratory has opened up new vistas for rapid multiplication of elite coconut palms. Clonal plantlets have been produced by culturing tender spindle leaf tissues, from 1-2 year old seedlings through somatic embryogenesis by passing the callus phase. Manipulation of culture media

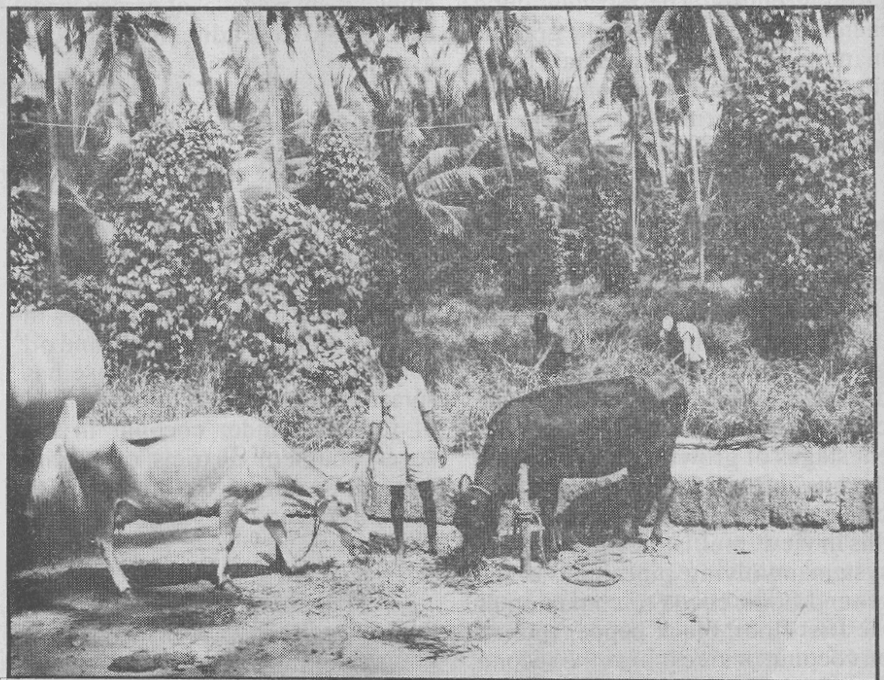


Fig.6 Mixed Farming System



Fig.7 Copra Dryer

composition has helped in overcoming certain difficulties in realising a viable complete plantlet and achieving an optimum root shoot ratio. This method after further refinement is expected to make clonal multiplication of high yielding coconut palms a reality.

Harvest and Post-Harvest Technology

Research in harvest and post-harvest technology aspects is aimed at developing improved devices and machinery for post-harvest practices for the benefit of small and marginal farmers.

(i) **Dryers:** Copra drying in the sun becomes impossible during the rainy season and hence the Institute has been developing different types of dryers to suit the requirement of small holder farmers and copra processors.

The solar cabinet dryer of 100 coconuts capacity helps to dry copra in four days while it takes about seven days under open sun. The quality of the copra obtained is also

Multipurpose dryers of various capacity like 100, 400, 1000 and 3500 to 4000 coconuts were devel-

oped. In these dryers, farm waste is used as fuel. Other plantation crops produce like arecanut, cocoa and cardamom can also be dried in these dryers with suitable modification wherever necessary.

(ii) **Copra Moisture Meter:** An electronic copra moisture meter designed and calibrated to determine the moisture level range of 5% to 40% with an accuracy of 95% is increasingly in demand by the copra processors.

(iii) **Dehusking devices:** A manually operated device developed for dehusking coconuts has given an out-turn of 120 nuts/hour when operated by an unskilled person. The breakage was less than 2% and the energy required for operation was also less compared to conventional method.

(iv) **Other devices:** The mechanical coconut bunch support prevents the buckling of heavy coconut bunches. This is more profitable than the conventional method of tying the bunches with rope.

An improved knife developed for harvesting coconut bunches can be tied to a long bamboo pole facilitating the harvest from the ground itself. About 80-100 palms can be harvested by one person with the device as against 40 palms by a climber.

Transfer of Technology

Efforts to disseminate the research results to appropriate agencies is an important and critical activity of the Institute. To ensure communication of results, CPCRI

brings out Newsletter, Monographs, Technical bulletins, pamphlets and folders connected with research. Also publicity is given through press, radio, television, etc. Besides **CPCRI** also participates and organises various Kisan Melas and Exhibitions.

Besides **CPCRI** is implementing various operational Research Projects to create an awareness among the villages about the advantages of coconut based integrated farming systems besides Lab to Land Programmes and **research-cum-demonstration** plots.

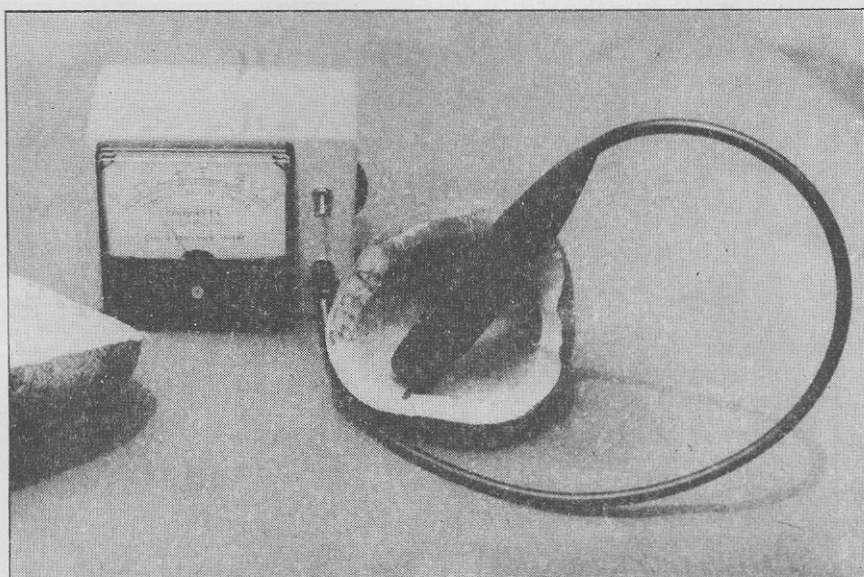


Fig.8 Copra Moisture Meter

