

Coconut Research Institutes in India :

## Regional Agricultural Research Station, Pilicode

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Coconut Research in India started on the West Coast of the erstwhile Madras State with the establishment of four research stations in 1916: one each at Kasaragod and Pilicode and two at Nileshwar. When the Indian Central Coconut Committee was established, the Kasaragod station was taken over by the committee in 1947 and it became Central Plantation Crops Research Institute (CPCRI) in 1970 under the ICAR. With the formation of Kerala State in 1956 the remaining three stations came under the Kerala Agricultural Department. In 1972, when the Kerala Agricultural University came into being one of the stations at Nileshwar (Nileshwar-II) and that at Pilicode were transferred to the Kerala Agricultural University with head quarters at Pilicode. Under the NARP Scheme, this station has been recognised as a Regional Research Station for the northern region comprising the districts of Kasaragod, Cannanore, Kozhikode and Malappuram with effect from 1st June 1980.

### LOCATION

RARS, Pilicode is located in Pilicode village of Hosdurg taluk in Kasaragod district. It is about

60 km north of Cannanore town by the side of the National Highway-17. The nearest railway station is Chervathur, which is about 3 km north west of the Research Station.

Nileshwar campus is situated in Nileshwar village of Hosdurg taluk in Kasargod district and is about 68 km north of Cannanore town lying on either side of the National Highway-17 and is about 1.6 km south west of Nileshwar Railway Station.

The present area of RARS Pilicode is 57.87 ha and that of Nileshwar 17.25 ha.

### IMPORTANT RESEARCH AREAS

In the beginning the activities were centred around introduction of coconut cultivars from different parts of India and other countries, selection, hybridisation, identification of superior local and hybrid varieties and their distribution among farmers. Very good achievements were attained in this regard. After the implementation of NARP, research activities were intensified and apart from research on coconut work on rice, pepper, vegetables, oil seeds, pulses, tubers, etc. were also initiated. Development of superior

varieties, management and plant protection are the major objectives.

### RESEARCH HIGHLIGHTS

From the very inception onwards, research was concentrated on evolving high yielding varieties of coconut, fertilizer management, intercropping, plant protection, etc. Two distinct varieties have been distinguished in coconut, viz. the tall and the dwarf. A key for the identification of varieties was developed at the Coconut Research Station, Nileshwar, as early as in 1939.

The morphological studies conducted at the Coconut Research Station, Nileshwar, in early 1930 indicated that the rate of growth of the stem and leaves varied with the varieties and management practices. A correlation study on length of leaf and yield of nuts revealed that the high yielding palms had significantly more number of leaves than the low yielding ones and that the longer the leaf, the higher was the yield. Under favourable conditions, the leaves of good yielders had a life span of 36 to 42 months. The life span of leaves was shorter in the poor

yielder as compared to those of medium and heavy yielders. The leaves opened at shorter intervals during the North East monsoon (September-November) compared to South West monsoon (June-August) and summer (March-May) months. The rate of production of leaves alone could not be indicative of the bearing capacity of the palm.

Studies conducted simultaneously at Nileshwar and Pilicode revealed that the varieties differed significantly in their flowering behaviour. Normally, the dwarf types came to flowering in 36 to 42 months and the tall in 7 to 8 years. However, it was also observed that the Tall types under ideal conditions, flowered in 5 years. The coconut palm has the inherent ability to produce one inflorescence in every leaf axil. When every leaf produces an inflorescence in the axil, the palm is considered to be a regular bearer. As early as in 1930, the scientists at Pilicode observed that only 34% of the West Coast Tall palms are regular bearers.

The seasonal variations in inflorescence production in West Coast Tall palms was also studied at Pilicode. It was found that percentage emergence of inflorescence was the highest (16.9) in the month of March and the lowest (3.0) in the month of December. The rate of production of female flowers was higher during the summer months of March, April and May as compared to the other months. The lowest rate (1.2%) was found in

the month of December. The number of female flowers varied with the inflorescence and the palms in a given type. The studies also indicated that the female flower became receptive 19.8 days after the opening of the spathe. The last male flower was shed 17.9 days after the opening of the inflorescence. The opening of the first female flower took place 3.2 days after shedding of the last male flower. This mitigated the chances of self pollination in the tall types.

Investigations conducted at Pilicode to estimate the extent of self pollination in coconut cv. WCT under natural conditions revealed that self pollination was a rare phenomenon in the Tall varieties. Further studies on pollination revealed that wind as well as insects act as pollinating agents. The major insects involved were bees, flies and ants.

Experiments conducted to find out whether setting percentage and nut yield could be increased by artificial pollination showed that neither the setting percentage nor the nut yield was affected by artificial pollination.

The observations on the fertilisation of female flowers (buttons) in the West Coast Tall palms indicated that a large number of buttons failed to develop into nuts due to lack of fertilization. As a result of this many of the buttons were finally shed by the palms. Lack of pollination and fertilization, defects in the flower, physiological disorders, genetic

nature of the variety, pests and diseases and unfavourable environmental conditions were identified as the factors responsible for button shedding in coconut.

The influence of season on the size of nuts was studied in the cultivar West Coast Tall. The nuts harvested during April/May were the biggest and those harvested during December/January the smallest. The nuts harvested in the month of October were the smallest in volume. In copra recovery, the nuts harvested in the hot summer (March-April) were superior to those of the other months. They yielded more copra per nut. The nuts harvested in the cold winter months of December and January yielded more oil.

The organic traits of coconut seedlings leading to high yield have been identified at Nileshwar and Pilicode based on a series of investigations conducted as early as in 1930. The criteria for selection of mother palms and seedlings were developed. It was also found that seednuts of both 11 and 12 month age groups are suitable for nursery purposes. Another study has revealed that the best time for the selection of seednuts was February to May which coincided with the summer season in Kerala State. The percentage of ungerminated nuts was found to be higher in light bunches than in the medium or heavy bunches. The nuts from the heavy bunches germinated earlier. In a study on the influence of shape of seednut on germination, it was

observed that spherical nuts germinated earlier.

Another investigation indicated that heavy seednuts (cultivar: WCT) with good copra content floated vertically with stalk-end up and put in water, the seedlings from such nuts were more vigorous than those raised from obliquely or horizontally floated nuts.

Experiments conducted at Pili-code clearly indicated the need for preservation of seednuts without dessication till they were sown in the nursery. Another study has indicated that the seednuts could be preserved in sand without loss in viability upto 9 months from harvest.

A number of studies have been conducted at Nileshwar and Pili-code on nursery techniques and selection criteria for coconut seedlings.

In order to find out the position of nuts in the seedbed, an experiment was conducted at Nileshwar. The results revealed no significant difference between the two treatments viz. horizontal and vertical sowing. A series of changes take place in the nut as its embryo germinates and develops into a seedling. The studies on these aspects led to the following conclusions:

- a) The nut water disappeared in the sixth month after sowing.
- b) The seednut started to germinate 12 weeks after sowing under normal conditions. The maximum percentage of germination was attained

between 17 and 18 weeks after sowing. No germination occurred 23 weeks after sowing.

- c) The first leaf appeared in the second month after germination.
- d) The production of root commenced in the first month after sowing.
- e) The increase in girth at collar and the height of seedling were gradual.
- f) There was a gradual fall in the thickness of the kernel as the seedling developed.
- g) The apple filled the whole cavity of the nut in the fifth month, lost its sweetness thereafter and became papery as the seedling developed.

Experiments conducted using seedlings of different age groups have revealed that one year old seedlings are best suited for garden lands.

An experiment was conducted to determine whether late germinated seedlings are inferior in growth performance. The results indicated that the early germinated seedlings were significantly superior to the late germinated ones in respect of plant height and girth at collar. The mortality of seedlings was high among the late germinated seedlings. The nursery studies conducted at Nileshwar during 1932 - 33 showed that the girth at collar and early splitting of leaves were the most important traits of quality seedling.

Partial removal of husk from the stalk - end portion of nut prior to sowing hastened the process of germination and increased the girth at collar. The poly bag seedlings were superior to the seedlings raised in conventional seedbeds in respect of early germination, girth at collar, plant height and leaf production.

The introduction of coconut types for yield evaluation was started as early as in 1923 at Pili-code, with the ultimate objective of identifying elite types with high yield. The research station maintains a unique collection of coconut germplasm consisting of 31 exotic and 36 indigenous types. These are being screened for their yield and disease tolerance. An evaluation of these has revealed that Philippines Ordinary, Lakshadweep Ordinary, Cochin China, Java, New Guinea and Spicata are highly suitable for cultivation in the northern zone under rainfed conditions. Philippines Ordinary and Lakshadweep Ordinary ranked first in yield of copra and number of nuts respectively.

Fifteen types of coconut in the germplasm were also evaluated for their toddy yield. The best yielder was Lakshadweep Ordinary (1.66 litres per day). The popular cultivar WCT yielded only 0.65 litres per day. Siam and Spicata did not yield any toddy at all.

Systematic hybridisation studies were taken up in the year 1932-33. The hybrid seedlings raised from the crosses done at

Kasaragod were planted in Nileshwar. Thus the first ever planted coconut hybrid plantation came into existence in the year 1936-37.

The following observations were recorded on the seedlings raised by artificial pollination. The rate of emergence of leaves in the hybrids involving dwarf parent either as female or as male was markedly above that of the rest. As regards height of the seedlings, it was noted that the seedlings from parents which were high producers of female flowers were generally superior to the others.

The important conclusions drawn from the study are;

- 1) The selfed progenies were inferior to the hybrids.
- 2) The crossed progenies of the dwarf females and tall males confined to a dwarf type.
- 3) The progenies of the dwarf males and the tall females showed good girth measurements.
- 4) The inclusion of dwarf element in hybridisation hastens the early expression of the leaf splitting nature of the seedlings.

The tall types usually came to flowering 7 to 8 years after planting and the dwarfs after 3 to 3½ years. The F<sub>1</sub> progenies of the cross between the two types flowered at the age of 4½ years. The inheritance of age at first flowering thus appeared to be intermediate in character between those of the parents

A comparative study of four hybrids obtained by crossing selected high yielding tall palms

with dwarf green male parent revealed that these progenies possessed hybrid vigour. The annual yield of copra per palm in Tall x Dwarf hybrid was much higher than that of WCT. The early bearing habit of the dwarf parent was inherited by the hybrid and it attained the steady bearing period much earlier than the tall types. Based on these observations the hybrid Tall x Dwarf was popularised among farmers.

A large scale programme for breeding coconut was taken up based on the consistently good performance of Tall x Dwarf progenies for over 15 years. The Tall x Dwarf palms had the economic characters of early bearing, high yield and good quality of copra and oil.

In a study for testing the suitability of Tall x Dwarf hybrids for further propagation by selection from the natural progeny, observations on the vegetative characters were recorded at Pilicode in the progenies of Tall x Dwarf and the natural progenies of West Coast Tall. The natural progenies of Tall x Dwarf were found to be significantly superior to West Coast Tall in the rate of leaf production.

In order to study the transmission of hybrid vigour to the progeny and to find out whether it would be advisable to use natural progenies of the hybrid for further propagation a study was conducted at Nileshwar. The (Tall x Dwarf) x (Tall x Dwarf) progenies showed high precocity. The natural progenies of Tall x Dwarf and back cross of Tall x

Dwarf with West Coast Tall gave high yield and good quality nuts. The same parental cross of (Tall x Dwarf) x (Tall x Dwarf) showed very poor performance in respect of yield and nut characters.

Experiments were conducted with the objective of finding out how far the economic characters of both Spicata and Typica varieties, viz., the high rate of female flower production of Spicata and the high setting percentage of Tall could be combined in their progenies.

The results revealed that in the case of female flower production and yield, out of thirty eight palms flowered in the cross of Tall x Spicata, twenty eight had the spikeless character. In the reciprocal cross, out of the twenty five flowered, fourteen showed typica character while eleven were spikeless.

In order to find out whether method of pollination in coconut had any influence on the performance of progenies evolved through selfing and natural and artificial crossing, observations were made on palms planted in the year 1935-36. The progenies evolved by hybridization were found to be better than natural and selfed one.

Coconut being a cross pollinated crop is found to exhibit inbreeding depression. This phenomenon has been confirmed in the studies conducted in the station from 1926 onwards by repeated selfing of five elite palms. Heterosis has also been confirmed when sibmating was done between progenies of the same parents.

In the earlier studies, the inter varietal crosses involving Ganga-bondam as the male parent proved better than the other dwarfs like Chowghat Dwarf Green or Chowghat Dwarf Orange. Therefore to ascertain the combining ability of Gangabondam with Tall female parents, concerted efforts were made in 1946-47 by crossing it with cultivars like Lakshadweep Ordinary, Lakshadweep Small, Andaman Ordinary, Cochín China, West Coast Tall and Java.

The observations made during the subsequent years revealed that the progenies of Tall x Gangabondam performed better. The hybrids commenced flowering in 5 years and started regular bearing at the age of 14 years. The results thus established the combining ability of Gangabondam with the Tall cultivars in general. Among the hybrids Lakshadweep Ordinary x Gangabondam, Andaman Ordinary x Gangabondam, and WCT x Gangabondam were superior to others in respect of copra yield per palm and annual outturn of copra per unit area. These three hybrids were released by the Kerala Agricultural University as promising coconut varieties for cultivation. They were named as Lakshaganga, Anandaganga and Keraganga respectively.

## CULTURAL PRACTICES

The yield response of coconut cv. WCT to density of planting was studied at the Coconut Research Station, Pilicode, (gravelly laterite soil) during the period 1925 - 1966 with three spacings - 6.7 m, 7.6 m and 9.1 m - to

accommodate 247, 198 and 148 palms per hectare, respectively in a triangular planting method. The results revealed that the density of planting had no significant effect on individual palm yield although the nut yield per unit area was the highest in the plant stand of 247 per ha (6.7 m spacing). It is noteworthy to mention that under rainfed conditions at Coconut Research Station, Balaramapuram (Red loam soil) it was proved that under average fertility conditions, a spacing of 7.5 m x 7.5 m was the optimum for the variety West Coast Tall.

The depth of planting of coconut seedlings depends on the texture and depth of soil and the local climatic condition. In order to arrive at an optimum planting depth for coconut, a field trial was initiated at the Coconut Research Station, Pilicode (Soil type - laterite) as early as 1923.

The growth performance of the surface planted seedlings was poor and the mortality rate was high. Such seedlings developed very shallow root system and dried up during the summer months. The deeper the planting, the better was the growth performance. However, in nut yield, female flower production and setting percentage, the depths of planting did not exert significant differences.

An experiment to compare the effect of ploughing and digging on coconut yield was started in 1942 at Pilicode. The results showed that ploughing thrice in June, September and October

resulted in the highest net return per palm which was closely followed by the treatment receiving one digging in August / September. It was also observed that digging resulted in the maximum control of weeds.

In an experiment conducted at Pilicode to study the effect of burying coconut husk (58292 per ha) and leaf (3335 per ha) in linear trenches of 1.8 m x 0.45 m dug in between rows of coconut palms, it was found that the yield of nut increased significantly from the third year onwards. The beneficial effect of burying husk lasted for 6 years.

In order to study the effect of opening trenches in the coconut gardens and filling them with trash and compost on moisture conservation and growth and yield of coconut, an experiment was conducted at Pilicode during 1932. Trenches were cut open in the experimental plots to a depth of 30 cm and width of 60 cm at the close of the South-West monsoon. They were then filled with dry coconut leaves, green leaves and compost and covered at the end of North-East monsoon. The results indicated that

- a) Trenching resulted in marginal increase in leaf production.
- b) There occurred a general increase in the production of spadices in both the treatments in the first two years. In the third year there was a significant increase in spadix production due to trenching.

- c) The production of female flowers increased by 38% due to trenching in the third year.
- d) Trenching led to a reduction of 5.1% in the shedding of buttons.
- e) Trenching resulted in a marginal increase in nut yield.

Experiments conducted in this research station has clearly indicated that removal of one or two older functional leaves of coconut had no adverse effect on the coconut palm. Cutting two leaves every month from January to May fetched the maximum net profit of Rs 1109 per hectare per year.

### SOILS AND NUTRITION

Research on the nutritional aspects and fertilizer requirement of coconut was started as early as in 1923 in this Research Station. Some of the early experiments gave important information on the nutritional requirements of the palm. In an experiment at Pili-code with palms growing on laterite soil, it was observed that broadcasting fertilizers over the entire area and ploughing in or applying the fertilizers in circular basins of 1.8 m radius and 30 cm depth around the palm was superior to the method of applying fertilizers in linear trenches in between the rows of palms.

A fertilizer trial for coconut (cv. WCT) was conducted in cultivators' fields under rainfed conditions in laterite soils. The data recorded over a period of six years

have revealed that application of NPK @ 0.50, 0.32 and 1.2 kg. per palm per year along with 25 kg green leaf and 10 kg FYM increases the yield upto 67.0 per cent. It was also found that application of fertilizers at the above level has a benefit cost ratio 3.96 which is most economical as against 1.45 in case of cultivators' practice of applying 25 kg green leaf and 10 kg FYM per palm per year.

Trials were conducted to study the effect of application of NaCl and KCl in adult palms belonging to the variety West Coast Tall. The results indicated that application of NaCl and KCl (750 Na<sub>2</sub>O : 250 K<sub>2</sub>O g/plant) increase the nut yield of palms by 43.91% over the pre treatment yield.

In young Dwarf x Tall hybrids the application of NaCl and KCl is found to promote vegetative growth and early flowering habit.

Cultivation of high yielding varieties and hybrids is being popularised in recent years. Studies conducted at Pilicode have clearly indicated differential uptake of nutrients by different varieties and hybrids.

### WATER MANAGEMENT

Response of coconut palm to summer irrigation has been observed in almost all the experiments conducted. At Nileshwar (soil type: littoral sand), the yield response to irrigation was assessed on a group of 70 year old palms from 1959 onwards.

The response to basin irrigation was comparatively high in red

sandy loam soil than in littoral sand.

Another irrigation experiment was laid out in the red sandy loam soils of Nileshwar. The production of female flowers and setting percentage were observed to increase considerably due to irrigation. The overall increase in setting percentage was 39.8. The overall influence of irrigation on these yield attributes did reflect on the final yield. Irrigation @ 450 litres/palm/week during the summer months will increase the yield of nuts (more than 50%), quality and quantity of copra.

Young coconut palms require frequent irrigation. The size and vigour of the seedlings depend on the availability of soil moisture and plant nutrients. This was clearly evident from the studies initiated at Nileshwar (red andy loam soil).

The objective of the experiment was to find out the response of Tall x Gangabondam hybrids to irrigation and fertilizer application right from the initial stages of planting. Irrigation at IW / CPE 1.00 significantly increased the girth at collar and the number of leaves during all the years of observation from 1984 onwards. The best characters were 0.50, 0.50, 1.00 kg. of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O respectively per palm per year. A combination of these treatments was found to be ideal for Tall x Gangabondam hybrids.

Another experiment was started in the year 1983 to find out the effect of water saving irrigation techniques on the growth and

productivity of coconut cv. WCT right from the seedlings stage. The treatment receiving drip irrigation at IW/CPE 0.50 and a fertilizer dose of 0.50, 0.32, 1.20 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per palm per year was superior to the rest.

Adequate drainage is necessary to alleviate the ill effects of high water table. In a study conducted at Nileshwar, it was found that surface drains of 1.5 m depth provided in between rows of coconuts increased the yield by 84.3%. The crop was irrigated during summer months.

With the available observation and experimental evidences, it can be stated that summer irrigation is the most productive input in coconut cultivation.

#### PEST AND DISEASE MANAGEMENT

The coconut palm is infested by a number of pests and diseases inflicting heavy crop losses. A number of experiments were conducted at Pilicode to study different aspects of important pests and diseases affecting the crop in northern Kerala.

The experiments conducted revealed that the attack of Rhinoceros beetle was maximum during the summer months from March to June and minimum in September—October. The exotic varieties were more susceptible than West Coast Tall and other cultivars.

The biology of the Cockchafer beetle (*Leucopholis coneophorus*) has been studied in detail. An effort was made to correlate the larval populations with the weather and found that the mean monthly rainfall was the most important factor contributing to the abundance of the larvae in the soil. Studies conducted at Nilesewar revealed that soil application of Chlordane 10% dust at 60 kg/ha once or 30 kg/ha twice a year was effective in

controlling the root grub. Among the non-insect pests, rodents are the most important group causing severe damage to coconut. Recent studies using bromadiolone cake (a single dose anticoagulant containing 0.005% of the toxicant) gave encouraging results at Pilicode.

Stem bleeding is a very serious disease of coconut in the northern districts of Kerala. Studies have been conducted at the RARS Pilicode on symptomatology, etiology and control of the disease. Earlier studies on the control of the disease indicated that removal of the decayed tissues and application of coaltar or Bordeaux paste in the affected area checked the spread of the disease. Sanitation of the coconut garden as a whole could also reduce the disease incidence. Studies on chemical control of the disease revealed that drenching with 0.1% Calixin (25 litre per palm) reduced the disease intensity considerably. Application of Neemcake (5 kg/palm) and drenching the basin with 1% Bordeaux mixture was also found to be effective in reducing the disease intensity.

From 1922 onwards, control measures were tried against bud rot. The affected portions of the trees were removed and Bordeaux paste was applied. Prophylactic spraying with 1% Bordeaux mixture was given to coconut palms in May and June every year. Application of Bordeaux paste or Ridomil M2 (0.8%) + Cuman L (0.08%) was also found to be effective. Studies on the incidence of the disease during the different months of the year revealed that the maximum disease was noticed in August followed by July.

During 1986, a disease causing extensive damage to the foliage was found to occur in many parts of the northern Kerala. The dis-

ease symptoms began from the tip or the margin of the leaflets and spread downwards in a concentric manner. Sometimes 10 to 17 leaves of a palm were seen affected. *In vitro* studies revealed that the causal organism was *Pestalospaeria elaeidis*. Spraying with Bordeaux mixture (1%) or Bavistin (0.1%) after removing the infected leaves was found to control the disease.

Experiments were conducted to study the role of fungi in causing button shedding. *Pestalotia*, *Botryodiplodia* sp. and *Phytophthora* sp. were isolated from shed buttons and tender nuts.

Multiple cropping with coconut as the dominant component has a long tradition in Kerala State. Research work has been carried out on multiple cropping at RARS Pilicode.

The earlier trials were mostly confined to screening cereals, millets and oil seed crops in the partial shade of coconut palms with the ultimate objective of increasing the net returns from the coconut gardens. Later, long seasonal crops like cassava, banana, ginger and pineapple and perennial crops like pepper, cacao and cinnamon were introduced in the system. All the crops were grown under rainfed conditions.

From trials conducted to identify suitable varieties of pulses to be grown as floor crop in coconut gardens, the cowpea variety HG 22 was found to be superior to the rest. In black gram varieties KMU - 3 surpassed the rest. Among the 24 entries of green gram DM - 3 was found to be superior.

Among the eight Sweet potato entries tested as floor crop in coconut garden H - 4021 gave a maximum yield of 4888 kg/ha

while the Kanhangad local yielded only 2963 kg/ha.

A fertilizer trial on sweet potato grown as a floor crop in coconut garden has indicated that application of 25 kg N and 50 kg K per hectare gives the maximum yield for this crop.

In an experiment to identify the most suitable variety of banana for intercropping in coconut garden, robusta gave maximum yield as well as fetched maximum profit at Pilicode.

An experiment on the mixed cropping of cacao was initiated at Pilicode in the year 1970 to study its influence on the yield performance of coconut under rainfed conditions. There was no significant difference between the two systems of planting in the number of pods per plant. However in per hectare yield the double hedge systems was significantly superior to the single hedge system owing to nearly double the number of plants in the former.

An experiment on multistoreyed cropping was laid out in 1970 at Pilicode. The crops included were coconut, cacao, black pepper and pineapple. Cacao was planted under double hedge system. The results showed that a maximum profit of Rs. 17,430 could be generated from the multistoreyed cropping system involving coconut, pineapple, cacao and black pepper.

Correlation between the seasonal rainfall and the yield of nuts was worked out. The study revealed that the second year's yield was positively correlated with October to April rainfall while it was negatively correlated with June to August rainfall.

The button shedding attained the highest value of 83.02 per cent during the South-West monsoon. The study also indicated significant positive corre-

lations between the percentage of button shedding and the amount of rainfall, the intensity of rainfall and the minimum temperature.

The growth and yield response of coconut to drought was studied. Weekly aridity indices were worked out at RARS Pilicode and an arbitrary classification was derived for assessing the effect of drought on coconut palm. An agricultural drought classification has been proposed for the crop depending upon the magnitude of index of moisture adequacy and its impact on nut yield.

#### RESEARCH ON OTHER CROPS

Out of the 100 cultivars of rice tested in a screening trial to find out suitable varieties for the region, 22 numbers have been promoted for preliminary yield trial.

Evaluation of popular modern varieties of paddy is being carried out with a view to identify the most suitable variety for the region. Studies have revealed that Cul 1999 for viruppu and IR 20 and Cul 1065 for the mundakan season are suitable.

Among the eight popular local cultivars screened for viruppu season, varieties Allikkannan and Malakkaran were found to be the top yielders. Thowan was found to be better among the short duration varieties. In the mundakan season, variety Chitteni outyielded the other five varieties.

A large number of accessions of rice, both local tall indicas as well as modern varieties were screened for disease and pest resistance/tolerance. Mala, a high yielding variety of rice was found to be tolerant to sheath blight. Its grain and straw yields were also high.

Dithane M-45 can be used for controlling sheath blight of paddy. It is cheaper than any other fungicides presently recommended.

Experiments conducted has

revealed that *Azospirillum*, a potent nitrogen fixing bacterium, occurs in the root environments of various spices and plantation crops. Root functions and root development in pepper cuttings have also been found to be enhanced by inoculation of the cuttings with *Azospirillum*. It also favours the formation of more healthy and strong roots and shoots.

#### TRANSFER OF TECHNOLOGY

The transfer of technologies is carried out mainly through the personnel of the Department of Agriculture. On farm trials are conducted under the immediate supervision of the scientists and with the co-operation of the field staff of the Department of Agriculture to test the performance of the technologies in the farmers' fields.

Lab to land programme, village adoption programme, training and Krishi Darshan programme were implemented. A number of farmers' seminars, Kissan Mela and exhibitions were arranged and the farmers were apprised of newer crop production technologies.

#### PUBLICATIONS

Popular articles, books and technical bulletins were published for passing on scientific information to farmers. Apart from this, many radio programmes were conducted. A large number of research papers were also published from the station.

The Regional Agricultural Research Station, Pilicode, thus functions as a leading centre to cater to the needs of the farming community in disseminating scientific information on all aspects of crop management, supplying of quality planting materials of coconut, pepper, vegetables, ornamental plants, etc. and identifying and solving problems on various aspects of agriculture.