



PACKAGE OF PRACTICES FOR COCONUT

V. T. MARKOSE*

This is the first of a series of scientific articles on the Package of Practices for Coconut dealing with the various aspects of coconut cultivation from the selection of land, mother palms, seednuts etc. to the control of pests and diseases. The second and third instalments of the series will appear in the forthcoming issues of the Bulletin.

Introduction

India is the second largest producer of coconut in the world with an area of 1.075 million ha. producing 6200 million nuts annually. Ninety per cent of the total area under coconut in our country is

concentrated in the four southern states viz., Kerala, Tamil Nadu, Mysore and Andhra Pradesh. Kerala alone accounts for 75 per cent of the total area under and production. The crop is of considerable economic importance to

* Deputy Director (Dev.), Directorate of Coconut Development, Ernakulam, Cochin-11.

the Kerala State as its entire rural economy is woven around coconut and its products. To a limited extent coconut is also grown in States like Gujarat, Maharashtra, Orissa, West Bengal and in Union Territories viz., Goa, Pondicherry, Andaman Nicobar and Laccadive Islands. Coconut industry provides full or part time employment to about 10 million people in the country. The cost of annual production of coconuts is estimated at



An ideal mother palm

about Rs. 300 millions per annum. Coconut is also a valuable foreign exchange earner and is currently contributing Rs. 150 million from the export of coir, coir products and oilcake. There is also ample scope for exporting many other products such as desiccated copra, shell flour, charcoal etc. if only coconut based industries are properly developed. The crop is intimately connected with the fortunes of thousands of small and marginal farmers spread over the major coconut growing States.

The internal production of coconut was all along inadequate re-

sulting in import of copra into our country, in varying extent. The demand of coconut in the country is ever increasing and by the year 1978-79 it has been projected at 7700 million nuts. It is imperative that our country should urgently become self-sufficient in coconut production.

An ordinary tall variety adult coconut palm produces 12 leaves on an average in a year at the rate of one leaf every month. Each leaf axil bears one spadix resulting in the production of 12 spadices per year. Even after giving an allowance for probable abortion of the spadices at the initial stages for various reasons a total of 10 spadices can be expected to attain maturity under normal conditions. Assuming that each spadix produces an average 20 to 30 female flowers the potential

bearing capacity of the palm can be estimated at 200-300 mature nuts per year. But this assumption never comes true under field conditions in the case of 99 per cent palms. Defective pollination of female flowers, sub-optimum soil and climatic factors, short supply of essential plant nutrients and moisture, poor genetic make-up and other unidentified physiological factors result in shedding of buttons, and also nuts at various stages of their development. However, an average production of 100-150 nuts per palm per year is a reality in some of the well-managed gardens with genetically superior planting material. It is a matter of great concern that the average yield of the crop in our country is as low as 30 nuts per tree per year, compared to the high yield potential of 100 or more



A good coconut bunch—West Coast Tall

nuts per tree. Research findings on coconut indicate that by switching over to improved practices from the traditional line of cultivation a 50 per cent overall increase in production can be achieved. Expansion of area under coconut in the major coconut producing states at the present situation offers only very little scope for increased production, and, therefore, intensive cultivation, replanting and underplanting and also rehabilitation of the root (wilt) affected areas are the possible means which would enable the country to cover up the deficit in production and meet the increased demands for coconut in the years to come.

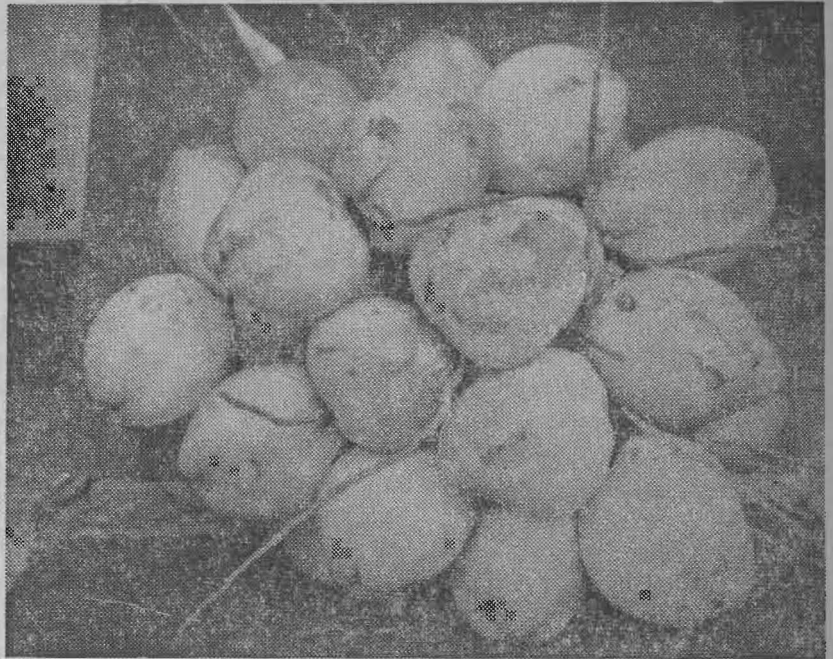
A set of package of practices is recommended at this context keeping in view of the latest research findings on the crop.

The Coconut (*Cocos nucifera* Linn.) is a perennial palm which grows and yields for more than eighty years under optimum growth conditions. In its lifetime there are three definite stages viz. (1) the nursery stage—extending to a period of 6 to 24 months according to local practices (2) the young palm stage or pre-bearing stage for a period of 5 to 10 years depending on the variety and the agroclimatic conditions and (3) the adult palm stage. The package of practices hence, are to be formulated keeping in view of the specific requirements of the crop in all these three stages of its growth.

Climate

The coconut palm is not very exacting in its climatic requirements, though it is essentially a tropical crop. It is highly adaptable to a variety of environments.

Of all the climatic parameters, rainfall and temperature appear to be more important ones for coconut cultivation. The distribution



A good coconut bunch—Dwarf

of rainfall especially is a very important factor worthy of consideration. A well distributed annual rainfall of 2000 mm is optimum for coconut cultivation without irrigation. Coconut, however, can grow and bear fruits even under a lesser intensity of annual rainfall. It can stand even much higher precipitation if the soil is well drained. In the absence of well-distributed rains irrigation definitely helps to maintain high yield.

The optimum mean annual temperature is found to be 27°C with a diurnal variation of 6°C to 7°C. The palm does not withstand considerable variation in temperature. It likes a climate characterised by warm and humid conditions. Persistence of highly humid conditions right through is not considered good for the palm. The palm also requires plenty of sunlight and it does not grow well under shade

or in too cloudy regions. About 2000 hrs. of sunshine in a year is considered necessary for the healthy growth of the palm.

Soil

As in the case of climatic requirements, coconut is adaptable to a wide range of soil conditions. It grows and yields well in the following soils.

1. Laterite
2. Sandy loam
3. Marine sand and coastal soils
4. Alluvial
5. Reclaimed marshy land
6. Volcanic and pumice soils

Varieties of coconut

There are two distinct varieties of coconut, viz., the tall and the dwarf. Due to indiscriminate outbreeding especially in tall wide range of variations occur within

these varieties. A very brief discussion on the varieties, types and hybrids which are recommended for cultivation is quite appropriate here.

The ordinary tall variety

In India this variety is also known as the West Coast Tall. The tall variety is extensively cultivated in all the coconut growing tracts of the world; and it commences bearing in six to eight years after planting under favourable agroclimatic conditions. It has a long and stout trunk growing to a height of 15 to 18 metres. The average yield under proper management is about 60 to 80 nuts per palm per year. The mean copra content is about 165 g. with an oil content of 72 per cent of the copra weight.

Laccadive ordinary

This is a tall type cultivated in

the Laccadive islands. They are comparatively heavy yielders, the annual production per palm of which is estimated at 120 nuts. Nut characters, copra and oil content are on par with the West Coast Tall.

Among the exotic types of coconut, introduced into our country, New Guinea, Philippines, Cochinchina and Java are quite suitable for cultivation as economic varieties.

The dwarf variety

The dwarf variety is characterised by its short stature and early bearing character. It has a thin trunk, Leaves are shorter than those of the tall. The dwarf variety starts flowering in 3-4 years, after planting and outyields the tall variety.

Among many forms of the dwarf variety found in the major coconut areas in India there are

three important types and they are (1) Chowghat dwarf (2) Malayan dwarf and (3) Gangabondom.

Chowghat dwarf

The Chowghat dwarf is a pure dwarf with three colour types viz.; orange, red and green. They are early and prolific bearers. This type of dwarf is very delicate and short-lived. The Chowghat dwarf is mainly planted for ornamental purposes. It is not advisable to raise commercial plantations using the Chowghat dwarf.

Malayan dwarf

This is an exotic dwarf type introduced into our country. In Malaya and Fiji Islands the Malayan dwarf is used on a large scale in commercial plantations. This type especially performs well under good soil and climatic conditions. In India at the New Ambady Estates at Kulasekharam, in the Kanyakumari district, the Malayan dwarf has been planted in about 60 ha. and this variety is reported to be quite economical under conditions prevailing there.

Trials with this dwarf in Jamaica have shown that the Malayan dwarf is resistant to the lethal yellowing disease of coconut.

In this type, there are both semi-talls and pure dwarfs. Semi-talls are slightly late in bearing less prolific than the true dwarf and produce larger nuts.

Gangabondom

This is not a true dwarf but a medium dwarf grown in Andhra Pradesh. Gangabondom variety starts flowering in about 4 years, after planting. The average yield is about 51 nuts per tree per year under Kerala conditions.

Earliness in bearing, production of more nuts and copra from a unit area than the tall and the resistance to diseases like lethal yellowing etc. are likely to increase



Selecting seednuts for sowing

the importance of the dwarf variety in future. Dwarf variety is also used for producing hybrids like T x D and D x T. The Malayan dwarf deserves special mention here. With irrigation facilities, and proper management practices cultivation of this is sure to prove a profitable proposition.

Coconut hybrids

Tall x Dwarf Hybrid (T x D)

In the T x D hybrid the ordinary tall is the female parent and the Chowghat dwarf the male parent. The objective of evolving this hybrid is to combine the desirable characters of both the parents in the offspring. Characters like early and profuse bearing of the dwarf parent, and economic nut characters like medium size, high copra out-turn and oil content of the tall parent are combined in the T x D hybrid.

The hybrid comes to bearing in about 4-5 years under favourable conditions. It produces an average yield of about 100 nuts per palm per year. The average production of copra per nut is about 176 g. and the percentage of oil in copra is 70.

The hybridisation work requires trained climbers for the purpose of emasculation and hand pollination. This is a laborious and time-consuming process which stands in the way of large scale production of hybrids.

Dwarf x Tall hybrid (D x T)

D x T hybrids are produced by crossing dwarf female parents with tall pollen parents. There is a distinct advantage in the production of D x Ts over T x Ds that it could be produced on a large scale by regularly emasculating the dwarf mother palms, permitting free natural crossing with the pollen



Sowing seednuts in the nursery

from the tall palms standing nearby.

In gardens where dwarf and tall varieties grow together inter-varietal pollination, in other words natural crossing, takes place occasionally. When seednuts of such dwarf palms are planted in a nursery some of the seedlings exhibit more vigour and rapid rate of leaf production than the true dwarfs. In the case of Chowghat Dwarf Orange, a change in *petiole colour* in the case of natural hybrids is also manifested. From a nursery of dwarf orange, natural cross hybrids can be very easily identified on the basis of increased vigour of seedlings and the chocolate or bronze colouration of the petioles. In the case of open pollinated Chowghat Dwarf Orange it has been observed that about 15-20 per cent of the seedlings turn out to be natural cross hybrids.

The natural cross hybrid or D x T hybrid is more vigorous than the dwarf and it commences bearing in 4-5 years after planting,

and outyields the tall variety. The average annual production of nuts per palm is 100 with an average copra content of 196 g. in the case of D x T hybrids. The copra also contains about 70 per cent oil.

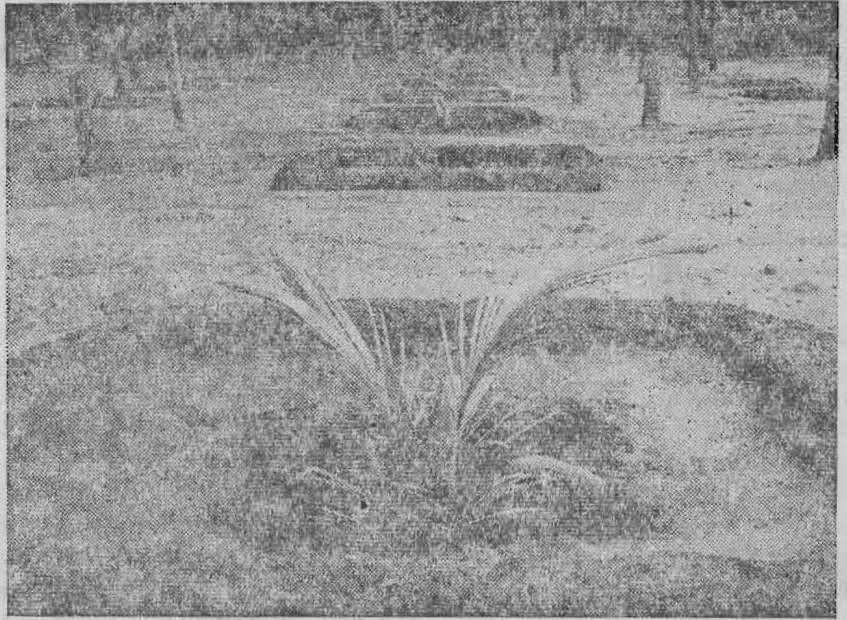
Those cultivators who own dwarf palms can attempt producing D x T hybrids, without much technical skill. Complete removal of male flowers immediately after the opening of the spadix, is the only operation to be carried out. This process is otherwise known as emasculation. Thus the possibility of self pollination is ruled out. Proper care should be taken not to injure the female flowers, while emasculating the spadices. The set nuts after the emasculation must be hybrids, due to cross pollination from the tall standing nearby. This is possible only where sufficient number of tall palms surround the dwarfs.

From the trials conducted at the Central Plantation Crops Research Institute, Kasaragode and Central Coconut Research Station Nileshwar hybrids like

x G (Tall x Gangabondum) and x G (Laccadive ordinary x Gangabondum) are also reported to be high yielders and hence recommended for cultivation.

Selection of planting material

In a perennial crop like coconut selection of quality planting material deserves special mention. If the original planting material happens to be of poor quality it will result in the establishment of a plantation which will be a source of regular loss to the grower. Of late, high yielding varieties and hybrids in all crops have become popular with the cultivators. In the case of coconut also certain varieties and hybrids are already proved to be high yielders as compared to the ordinary tall variety. Unfortunately the production of seedlings of such varieties and hybrids is limited, due to the built-in difficulties associated with coconut hybridization and the considerable pre-bearing period, which prevents rapid multiplication of such planting materials. Government nurseries and other departmental agencies however, have already started schemes on priority basis to produce seedlings of such varieties



Seedlings planted in well prepared pits

and hybrids in large numbers so as to meet the entire demands of the riots. The ordinary tall variety has already established itself in the country as the best common variety and is quite capable of giving economic returns under proper management practices. Hence, there is no harm to select the ordinary tall variety for large scale planting under the prevailing conditions. It is always better to purchase seedlings from Departmental nurseries and Research Centres. But it is often reported that such supplies very often do not cope up with the demand. Consequently, many private nurseries sprang up in different parts of the country. Many of the private nurserymen do not seem to apply the rigorous selection criteria for selection of mother palms and seedlings, as their main intention is not make maximum profit out of their business.

The growers who would like to produce their requirement of quality seedlings and also private nursery owners, can adopt the following procedure for the production of the ordinary tall variety seedlings.

The selection of planting material is made in stages. The following are the various steps to be taken in this connection.

Selection criteria for ordinary tall mother palms

Seednuts are collected from selected mother palms from a garden containing large number of high yielding palms. The mother palms should possess the following characters.

1. The average annual production should be more than 80 nuts with a minimum output of 16 kg. copra per palm per year.
2. Though age of the mother palm is not a very important factor, it is always better to select palms, by watching the performance for a few years after attaining the full bearing capacity
3. A mother palm should have 30 to 40 fully opened leaves on the crown.
4. They should be regular bearers with a minimum of 12 bunches with nuts at different



Planting the seedling

stages of development in the leaf axil at any time.

5. Mother palms should be free from diseases and pests.

Selection of seednuts

Under West Coast conditions January to March is the best time for collection of seednuts. In other areas, nuts collected in the peak harvesting months are selected. Mature nuts is 11 to 12 months old give maximum germination. If the mother palms are tall and the ground is hard it is advisable to bring down the nuts by ropes. The seednuts are to be stored in shade or in cool dry places before sowing. Dried up nuts with less or no water inside are unfit, for sowing. The seednuts can be preserved for a few months with the stalk-end up on the floor of sheds over a layer of sand about 3" deep and completely covered with sand. A maximum of 5 layers of nuts can be similarly arranged if large number of nuts are to be preserved.

The nuts are to be screened in-

dividually. Medium sized nuts with full of water inside and husked volume of 500 c. c. are selected for sowing.

Nursery

The nursery is raised preferably in sandy soils either in open land or in existing adult coconut plantations. To repel termite attack dusting the soil with 5 per cent BHC or Chlordane @ 120 kg. per hectare is advisable. The nuts are planted just before monsoon by placing in small mammatti holes and covered with sand. Horizontal planting method is found to give higher germination percentage. Spacing of 30 cm. (measured from the centre of the nut) in the row, 40 cm. between the row and 75 cm. between the bed is optimum. The nursery beds are preferably made long and narrow with provision for walking space in between. The width of the bed is adjusted to contain 4 or 5 rows only. Lay out of the nursery is given below:

Lay out

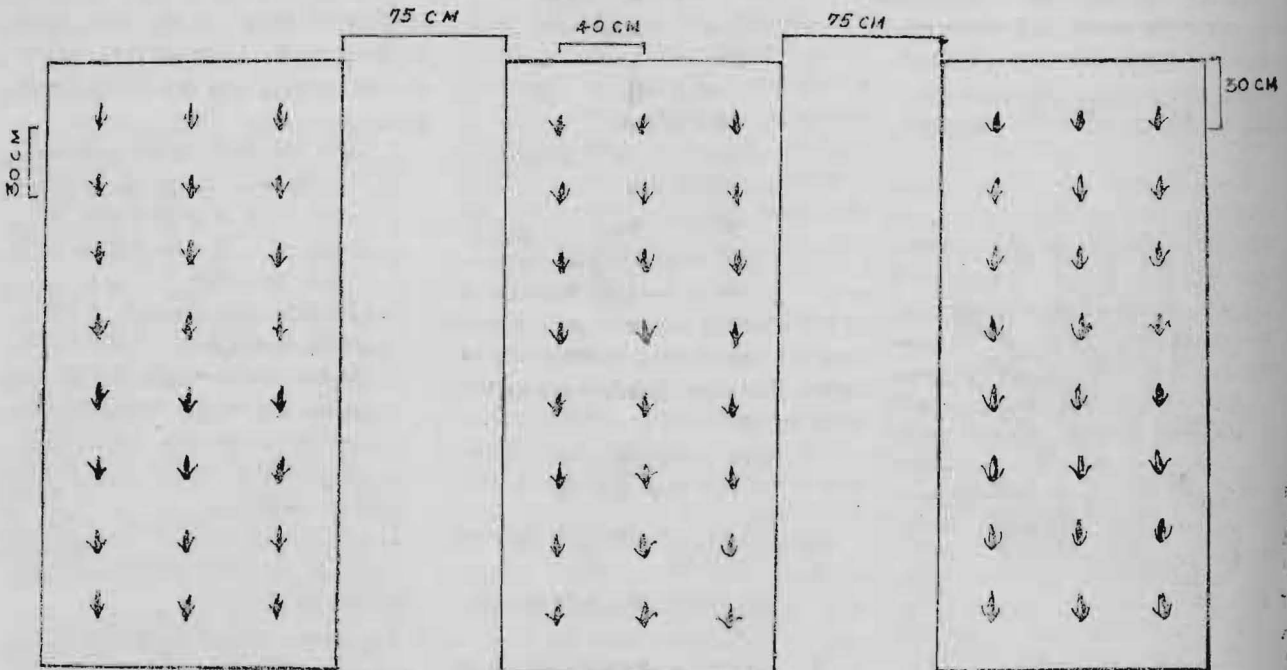
Germination of nuts starts 2-3

months after planting. Early germination is found to associate with early bearing and high yield. The nuts germinated after 5 months are to be rejected. On an average 80 to 90 per cent germination is possible. Screening of the seedlings is necessary to get the best results.

Manuring nursery

Experiments conducted in various countries on manuring seedlings at nursery stage indicated that such a practice definitely aids to produce seedlings with favourable nutrient status so that they may establish well, grow faster and yield earlier in the main fields. It is, therefore, reasonable to fertilize the nursery in the months of December, February and April to supply nutrients @ 40 kg. N + 20 kg. P₂O₅ + 40 kg. K₂O per application per one ha. nursery (Nelliat. 73).

Shade may be provided if the nursery is raised in open space. Irrigation by sprinklers or perfo sprayers is the ideally suited method for nurseries. If



Layout of the nursery

other methods are not available pot watering on every third day with 3-4 litres of water during the period of dry spell is also recommended. Spraying with one per cent BHC (wetable) and Fytolan in monthly intervals, can be resorted to in the case of disease / pest incidence.

The seedlings will be ready for transplanting in the field after about 4 months of sprouting. Though earlier planting is good for quicker establishment of seedlings 9 to 12 months old seedlings are generally preferred as they facilitate better selection. Seedlings of less than 9 months old can also be planted provided they have a minimum of 4 leaves.

Selection of seedlings

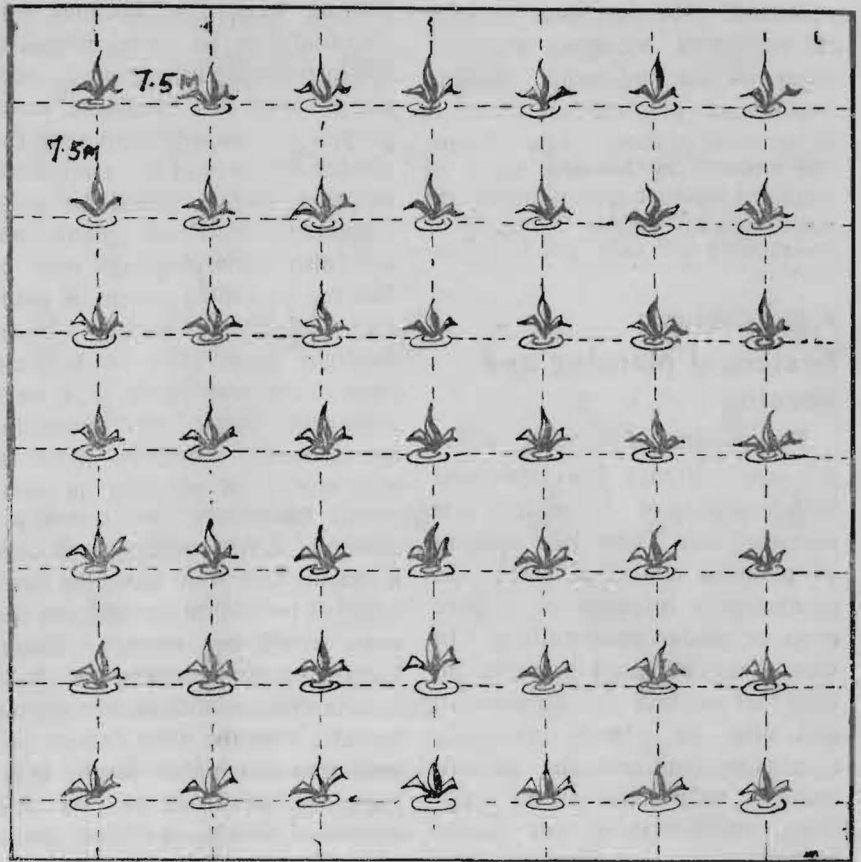
The selection of seedlings is based on the following characters.

1. Early germination
2. A minimum of 10 cm. girth at collar region
3. Good leaf and root development
4. Vigorous growth
5. Early splitting of leaves
6. One year old seedlings should have a minimum of six leaves.

Selection criteria for Chowghat Dwarf palms

Even though the dwarf is not recommended to cultivators as an economic variety, for the production of D x T hybrids and T x D hybrids, dwarf palms are required. Moreover, the dwarf is in great demand for ornamental purposes. In this context, one should be able to identify a true dwarf palm. The following general characters, however, can be taken into account while identifying Chowghat Dwarf orange palms.

1. Thin stem
2. Narrow base
3. Closer leaf scars
4. Short stature



Square method of planting

5. Early flowering
 6. Short petiole
 7. Narrow leaf blades
 8. Closer arrangement of leaflets
 9. Overlapping of male and female phases
 10. Retention of unfertilized female flowers
 11. Orange colour of petiole, spathes and tender nuts
 12. Round nuts without ridges
- The characters of chowghat dwarf green are similar to the dwarf orange palms except the following:

1. High female flower production and low setting
2. The petiole, spathes and nuts are green
3. The nuts are ridged with a beak
4. These are mostly self pollinated and the seedlings are

therefore more / or less uniform.

Selection of site and preparation of land

While selecting the site for coconut plantation deep soils are preferred. Shallow soils underlying hard rock, low lying areas subject to water stagnation and stiff clayey soils are to be avoided. Soils with soft laterite 2-3 feet below surface can also be selected. Facilities for irrigation have to be ensured if the rainfall is sub-optimum and also optimum or heavy but irregularly distributed. Coconut thrives very well in well-drained soils and if the site is susceptible to water stagnation drainage channels are to be provided well in advance.

In slopy lands contour bunds and terraces are pre-requisites. Shrubs and shady trees are to be

removed. Marshy lands have to be reclaimed by using alternate layers of silt and sand. Raising bunds and planting on them is economical in these areas. Forming mounds by heaping earth at required distance and planting on them with subsequent filling in of interspaces will save time in reclamation.

Field Culture:

System of planting and spacing

Two systems of planting are in vogue viz., square and triangular with a spacing of 7.5 m to 8.0 m on either side. These two systems of planting are ideal when the plantation is intended as a pure crop or under monoculture. In view of the increased pressure on land that we face in the country and also to obtain maximum returns per unit area, the present trend is to practice mixed cropping, multicropping and mixed farming in coconut gardens. (The

rooting pattern of coconut was also found to be quite congenial for introducing intercrops in coconut gardens). To facilitate intercropping or mixed cropping in the garden a change in the traditional planting system would be quite advantageous. Fresh plantations and also underplantings may be laid out in a third system of planting viz., Single hedge system. Sunlight penetration in between rows of coconut which is a very important factor for successful intercropping would be more in this system of planting as compared to square or triangular method. Single hedge system with a spacing of 6.0 m. along the rows and 9.0 to 10.0 m. in between the rows would be enough. Single hedge system of planting not only facilitates successful intercropping but also keep the palm density per unit area at a higher level. It is, therefore, advisable to try this system of planting in future plantations. Whatever may be the

system of planting care must be taken to orient the rows in north-south direction.

Planting pits

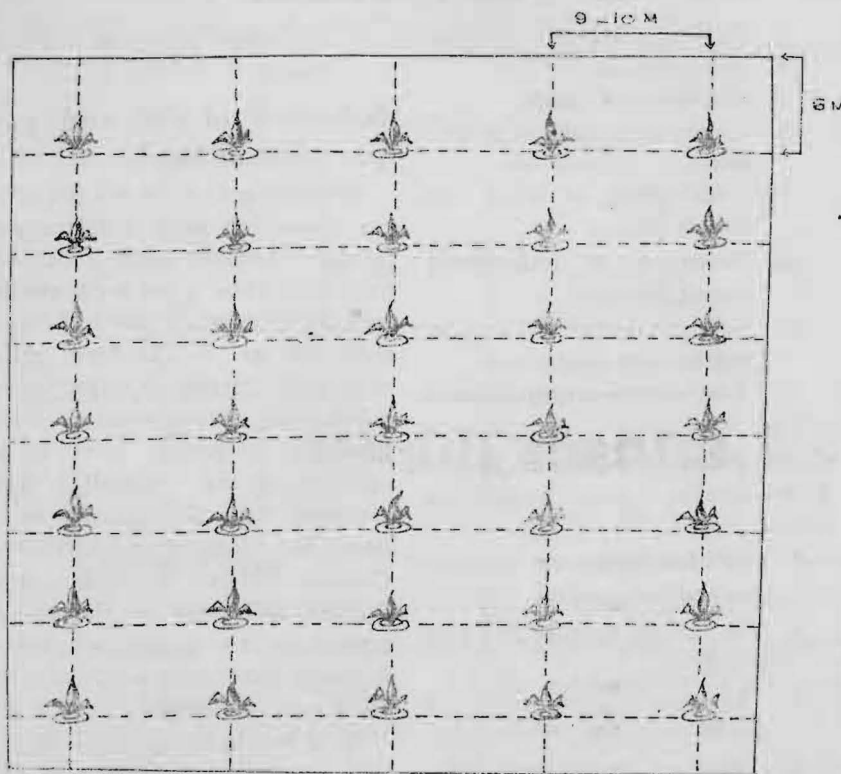
Seedlings are planted in pits or planting holes in almost all types of soils. The depth of planting pits varies with the type of soil. For light soils like loams 1m x 1m x 1m pits and for laterite soil 1.3m x 1.3m x 1.3m pits are recommended. In low lying areas subject to flooding and in areas where water table remains very high for a considerable period of the year, seedlings should be planted on the surface and raised mounds respectively. The intervening space between the adjacent mounds is filled up gradually to form a continuous bund.

Planting

The seedlings after uprooting from the nursery should be planted without much delay. With proper packing and careful handling the viability of the seedlings can be retained for 15-20 days.

Before planting in the main field a mixture of top soil, river sand and wood ash is added to fill 1/3 volume of the pit. Addition of river sand is beneficial to prevent termite attack. If sand is not available care must be taken to add top soil and ash. In sandy soils and in areas where drought conditions prevail it is advisable to bury 2-3 layers of coconut husk intermixed with 0.25 cubic meter of red earth. In the absence of red earth burial of husk alone has its own beneficial effect as a moisture conservative and soil ameliorant.

The seedlings are then planted in small holes, dug in the pits in such a way as the top of the husk of the seednut is just visible outside. The soil around the seedlings must be firmly pressed, but should not be allowed to cover the collar

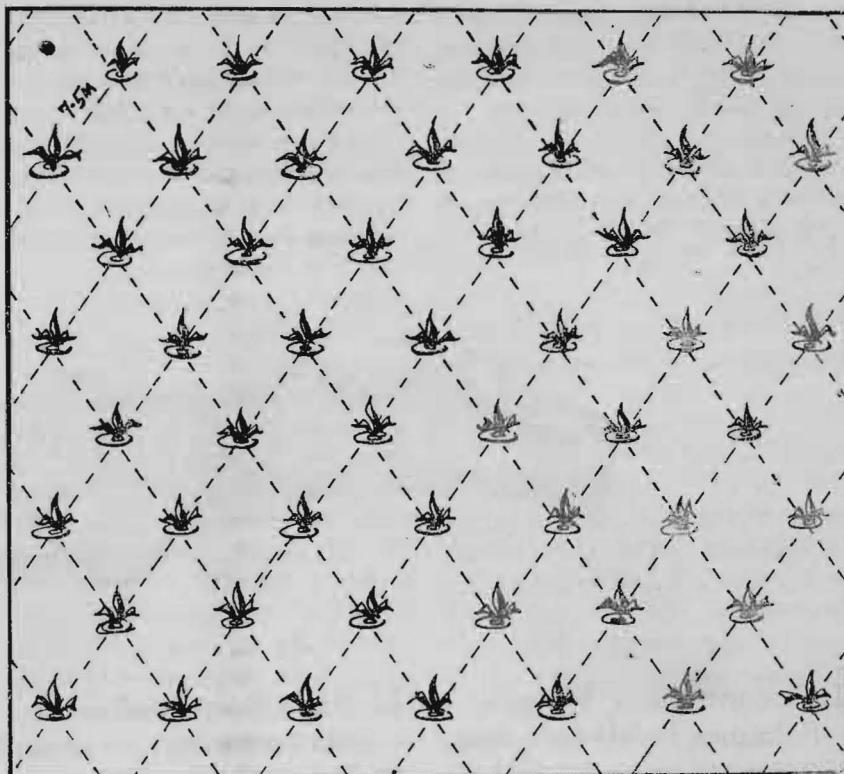


Hedge planting

of the seedling nor get into the leaf axils. The seedlings are to be supported by giving suitable props for an year if the season is windy. The best method of propping seedling is to provide three temporary poles in a triangular fashion and the cross straps at two or three different heights. Tarring the props would prevent termite attack and rotting and make them last longer.

Season of planting

The season of transplanting will vary from region to region, depending upon the situation of the land and climatic conditions. In most areas the best time for transplanting is at the commencement of the monsoons. Under the West Coast conditions May to June and October to November are the usual planting seasons. Where facilities for irrigation exist it is advisable to plant by the middle of April or early May so that by the onset of monsoon the seedling would have recovered the transplanting shock and subsequent establishment and



Triangular method of planting

growth would be faster. In the East Coast particularly in Tamil Nadu, transplanting is done during September-October. In reclaimed

areas and on bunds the best time for planting is August-September, after the heavy rains in June-July.

(to be continued)

TO OUR SUBSCRIBERS

COCONUT BULLETIN is generally published during the first week of the month subsequent to the month to which the issue relates. Complaints regarding non-receipt of copies should be sent during the third week of the publishing month. Subscribers should intimate the change in their address two months in advance for us to make the necessary alteration in our register. For any correspondence regarding the Bulletin the subscription number should be quoted. This is printed on the top left-hand side of subscriber's address.