

# Use good quality planting material for potential yield

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**C**oconut is a perennial crop having a longer life span. Hence the selection and use of planting material of high genetic quality assumes importance in coconut planting. The quality and excellence of the planting material is very important in deciding the future yield. Even when all scientific packages of practices are practiced the productivity may be low due to poor genetic quality of planting materials. Coconut is a crop of long gestation period providing long term yield for more than a human generation. It takes years to start yielding. Hence the original planting material must be rightly selected and should be best in quality. Seedlings must be brought from the selected seed nuts collected from high yielding elite mother palms. Otherwise productivity will be affected, even after proper fertilizer application and following scientific management practices.

Criteria for selecting the seed nuts and seedlings as well as the varieties to be cultivated should be strictly followed.

The seed production in coconut is a very tedious process compared to other commercial crops like rubber and horticultural crops like mango, guava, orange, apple, grapes, litchi etc. Rapid multiplication processes like budding, grafting and layering are not feasible in the production of the planting material of coconut cultivation. The only method available for multiplication of coconut seedlings is through seednuts. Even in hybridization of coconut, the process is laborious and time consuming. Large multiplication of a single variety is also very slow. As such, the production and propagation of quality planting material is most difficult in coconut compared to all other crops.



Availability of the planting material is the most important input factor for getting optimum yield from any crop. The quality of seed is highly correlated with mother garden characters in a cross pollinated crop like coconut. Hence for production of quality seedlings, selection of good mother garden, mother palms and procurement of good seed nuts is of great importance. They are very important.

The demand for coconut seedlings in India for new planting and replanting is estimated at hundred lakh annually. The present production is around 35 lakh seedlings only and hence there exist a demand supply gap of 65 lakh seedling annually. Coconut Development Board has established Demonstration cum Seed Production Farms in ten states and around ten lakh best quality seedlings are being produced and distributed to farmers annually. Board is attempting to provide the farmer with the best quality seedlings through its DSP Farms which will provide the best results in yield.

### Selection of seed garden

Seed gardens should be plantations with a record of consistently high yields. Gardens should have palms with a high proportion of heavy bearers but this must not be from very favourable conditions. Palms growing under very favourable conditions and receiving special care should be avoided as it will be difficult to assess their inherent yielding ability. Garden should be free from pest and disease incidence. Trees growing closer to households, cattle shed, compost pits etc. should be avoided.

### Mother Palm Selection

For production of quality planting materials it is essential to have good quality mother palms of the desired varieties. In the absence of commercially viable vegetative propagation techniques only seed propagation is possible in coconut. Therefore mother palm selection is a key factor in planting material production of coconut.



### Quality standards for mother palms

The mother palms should be between 15-45 years of age. The shape of crown should be spherical or semi-spherical. Petiole length and stalk of the bunches should be short and strong in nature and should have regular bearing habit with minimum annual yield of 80 nuts during the last 5 years. The tree should be regular and heavy bearer. A high yielding mother palm in its middle age will always have 25-30 fully opened leaves on its crown. The petioles should be short and stout and should be able to give effective support to the coconut bunches. The bunch stalks should also be short, strong and should not have the tendency of drooping down. Trees must have medium sized nuts with nearly round or spherical shapes. The dehusked nuts should have a weight of more than 600 g and the copra weight should be above 150g. Palms having long, thin and pendulous inflorescence stalks and palms producing long, narrow, small sized or barren nuts should be avoided. Palms showing alternate bearing tendency, palms shedding immature nuts in large numbers and palms grown under favorable environmental conditions e.g. trees near manure pits should not be taken.

### Maturity of Seed Nuts

The mature nuts are harvested when at least one nut in the oldest bunch starts becoming dry. In Tall varieties, it takes 11-12 months to become a matured seed nut whereas in dwarfs, nuts will mature in 10-11 months after the emergence of the inflorescence. Such nuts produce a resonant and ringing sound when hit with the harvesting knife or tapped by finger indicating that the husk is dry. Immature nuts will produce a dull sound. Harvest the bunches intended for seed nut by lowering them to the ground using a rope to avoid injury to seed nuts when palms are tall and ground is hard. The seed nuts should be medium sized, round or oblong in shape.

#### QUALITY STANDARDS FOR SEEDNUTS

Germination	> 80%
Purity	> 98%
Fruit weight	>400 gm (dwarf)
	> 600 gm (tall)
Nut water	present
Maturity	11-12 months (tall) &
	10-11 months (dwarf)
Pest and disease incidence	nil

## Collection of seed nuts

The time of seed nut collection may vary from region to region according to the seasonal conditions. It is always better to collect nuts that had undergone development during rainy season for seed nut purpose.

The proper time for the harvest of seednuts depends to a large extent on seasonal conditions of the locality. January to May is considered to be optimum on the West Coast because the nuts harvested during this season are generally bigger in size with a higher copra content than during other months and give maximum germination. The nuts can be planted in the nursery during the last week of May or in the first week of June with the onset of South West Monsoon whereas in East coast region seednuts can be sown in October- November.

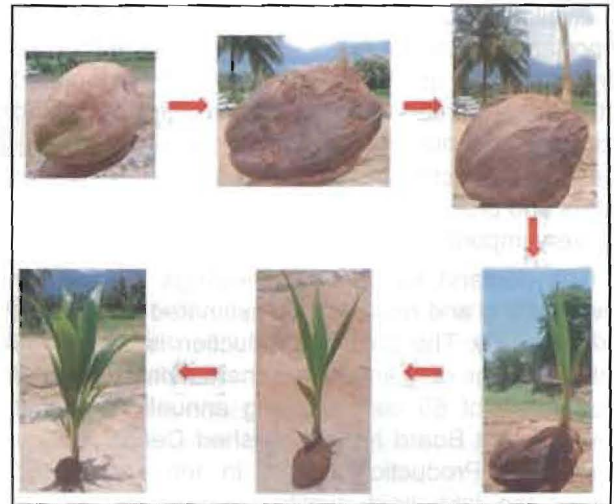
The season of harvest may have to be adjusted to suit local conditions so that the seed nuts can be sown in the nursery after about two month's storage. The shape and size should be proper and any type of damage of the nut during harvesting is to be avoided. The seed nuts should be fully mature, i.e., about twelve months old. Mature nuts will produce a clear metallic sound on tapping, which can be identified by experience. Immature nuts will produce dull sound. The presence of water has to be judged by shaking the nuts. Fully matured nuts will have dry husks with a distinct browning of the inner fiber.

## Method of harvesting

The nuts are to be lowered by ropes only to get an undamaged embryo. However in cases where mother palms are not very tall and the soil is loose and friable, the seednuts can be harvested by cutting the bunches and allowing them to fall on the ground.

## Storage of Seed Nuts

Storing of nuts is another important step for quality seedling production. The seed nuts after harvest are



*Growth from seed to seedling*

not immediately planted in the nursery. Usually the seed nuts are stored in shade for about a month till the husk becomes dry to facilitate speedy and maximum germination. To get better quality seedlings, the seed nuts of tall and hybrid are to be air cured for one month followed by sand curing for two months. For dwarf varieties, the air curing should be lesser than one month followed by sand curing for two months. In general seed nuts of tall variety are stored up to two months after harvest and dwarfs are sown within 15 days. For storing, arrange the seed nuts with the stalk-end up over an 8 cm layer of sand in a shed and cover with sand to prevent drying of nut water. Up to five layers of nuts can be arranged one over the other. The nuts can also be stored in plots, provided the soil is sandy and the ground is sufficiently shaded. In case of nuts harvested in May, heap them in partial shade, till husk is well dried and then sow them in the nursery. Nuts without the splashing sound indicate that the nut water has become dry and hence it should not be used for sowing. During summer, sprinkle water to prevent the drying of nut water.

## Nursery management

### Nursery Area

Select nursery area in a well drained plot with coarse texture soil near water source for irrigation. Nursery can be raised in the open space with artificial shade or in the adult coconut garden.

### Seed Nut Sowing

Sow seed nuts in a long and narrow bed at a spacing of 30 x 30 cm either horizontally or vertically in deep trenches with 20-25 cm depth. Five rows of nuts



*Sowing of seednuts*

may be sown in each bed accommodating 50 nuts per row depending upon the slope of the land. Raised beds may be prepared in places where drainage may be impeded during heavy rains. An 80 cm spacing in between the beds will enable the nursery operations from the sides without disturbing the beds.

#### **Inter cultural operations in Nursery**

Irrigate the nursery beds once in three days. Keep the nursery free of weeds. To manage the weed problem in coconut nursery, growing sun hemp twice followed by hand weeding at 6<sup>th</sup> month is found to be very effective besides yielding green manure for manuring the adult coconut palms. Provide shade to the nursery by raising *Sesbania* or *Leucaena* on the sides of beds during summer. Too much shade makes the seedling grow lean and lanky. The seed nuts start germination in 6-8 weeks after planting and the germination continues upto six months. Select seedlings that germinate before five months after planting. Remove those nuts which do not germinate five months after sowing. Survey for pest and diseases regularly. Precaution need to be taken by treating the soil for termite and root grub.

#### **Time of Sowing**

The proper time for planting nuts in the nursery vary from tract to tract depending upon the monsoon. By planting at the commencement of the rainy season it will be possible to avoid heavy and frequent watering required for good germination. May-June is the most appropriate time for planting seed nuts in the nursery.

However in West Coast region, seed nuts can be collected during the period from January to April and can be sown in June in the nursery whereas in East Coast region seed nuts are sown during October-November.

#### **Pretreatment of seed nuts**

At the time of planting seednuts, it is necessary to examine the nuts individually and discard those nuts in which the nut water has dried up or kernel has rotten during the course of storage. If the soil is dry and rains are delayed, soaking of seednuts in water prior to planting may be beneficial. Soaking of seed nuts in water for 15 days has been found to result in quicker and better germination. If the period is prolonged, germination and quality of seedlings gets affected.

#### **Method of Sowing in Nursery bed**

The seednuts may be sown in trenches of 20 cm deep and 40 cm apart in the nursery beds either vertically or horizontally with a spacing of 30 cm between the nuts (centre to centre). Though a higher percentage of germination is obtained with the horizontal planting, no difference manifest in the performance of the seedlings as compared to vertical planting. When seedlings are to be transported over long distances, vertically planted seedlings are easier to handle and can be compactly packed.

In the horizontal sowing, nuts may be sown with the widest of the three segments at the bottom and in vertical planting the stalk-end up. The depth of sowing may be adjusted so that the husk is just visible at the surface.

#### **Method of raising seedlings in polybags**

In order to avoid the transplanting shock the seedlings can be raised in polybags. For this, initially



*Polybag nursery*

the nuts are sown vertically in the nursery closely and when they start germinating, once in every fifteen days the sprouted nuts are collected and placed in polybags of 500 guage measuring 60 cm x 45 cm filled with potting mixture and 8-10 holes at the bottom. The potting mixture is to be in 2:1:1 ratio of the top soil, sand and farm yard manure. The sprouts are thus collected for a period of five months from the date of sowing. These polybags are kept at a distance of 0.50 to 1 m from bag to bag.

The advantage of poly bag seedlings is that there will not be transplanting shock and the seedlings are more vigorous. Seedlings establish quickly and start flowering early. Polybag seedlings can be stocked on availability and can be planted in the main field during conducive weather conditions.

### Care and management of the nursery

Watering the nursery beds is very important to ensure quick germination and proper growth of seedlings. The frequency of watering should be adjusted depending upon rainfall and other weather conditions, age of the seedlings and soil conditions. Watering may be done on every alternate days during the summer months.

In small nurseries, pot watering or irrigation using hose pipes can be adopted. Irrigation by sprinkler or perfosprayer is also ideal.

Mulching and shading will be very beneficial immediately after the monsoon ends, particularly when the nursery is located in the open areas.

During dry and hot weather, the nursery beds should be mulched and shaded with dry coconut leaves or any other suitable material. Coconut leaf mulch has been reported to promote early and better germination, good growth of seedlings and high percentage of good seedlings. Polybags may be kept under partial shade. The nursery beds must be weeded periodically.

A careful watch must be kept on the incidence of pests and diseases in the nursery. Control measures need to be adopted if symptoms of termite attack are noticed.

### Selection of Seedlings

Selection of seedling is a very important step in ensuring high yield. Under favourable environmental conditions and proper management, seed nuts of West Coast Tall palms will commence germination within 8 to 10 weeks after planting and 80-85 % of the seed nuts shall be germinated within 5 months.



Select 9 to 12 months old seedlings. Seedlings, which have germinated earlier, having good girth at collar and early splitting of leaflets should be selected for planting.

QUALITY STANDARDS OF SEEDLINGS	
Age of seedlings	10 - 12 months
Number of leaves	6 and above with short petiole
Girth at collar	>8 cm for dwarf and > 10 cm for tall
Height	> 80 cm for dwarf and > 100 cm for tall and hybrids

Select quality seedlings with a minimum of six leaves and girth of 10 cm at collar. The rest of the nuts, even if they remain viable, will have to germinate under increasingly unfavourable conditions which will result in poor growth. Such nuts should be discarded. Eliminate the seedlings which are deformed or having stunted growth. If rigorous standards of selection are adopted, 60 to 65 % quality seedling in a nursery can be obtained from the total nuts sown. The recovery

percentage may be lower if seednuts happen to be from poor mother palms or if nursery management like irrigation and plant protection has been neglected. All the seedlings raised in polybags are suitable for planting since selections are being made at the sprouting stage itself.

### Uprooting of Seedlings

After selection, the seedlings should be removed from the nursery only just before they are required for transplanting in the field. These seedlings should not be pulled out by force, but their roots should be neatly cut and the seedlings with the nuts gently removed. Pruning of roots is not harmful in younger seedlings (7 to 12 months old) but may cause some delay in establishment and retard the growth of older ones. The seedlings pulled out of the nursery should be planted as early as possible, preferably before 10 days.

Under favourable environmental conditions, the nuts of the tall variety of the coconut will commence to germinate 11 to 12 weeks after planting. The percentage of germination reaches the maximum between the 17<sup>th</sup> and 18<sup>th</sup> week and then commences to decline. Nuts which do not germinate within six months from the date of planting are removed from the nursery. Selection of seedlings in the nursery is based on characters which are believed and in some instances actually proved to be associated with good yield in the adult palms such as early germination, rapidity of growth, early splitting of leaves into leaflets, vigour, sturdiness and freedom from pests and diseases.

### Age of seedlings at transplanting

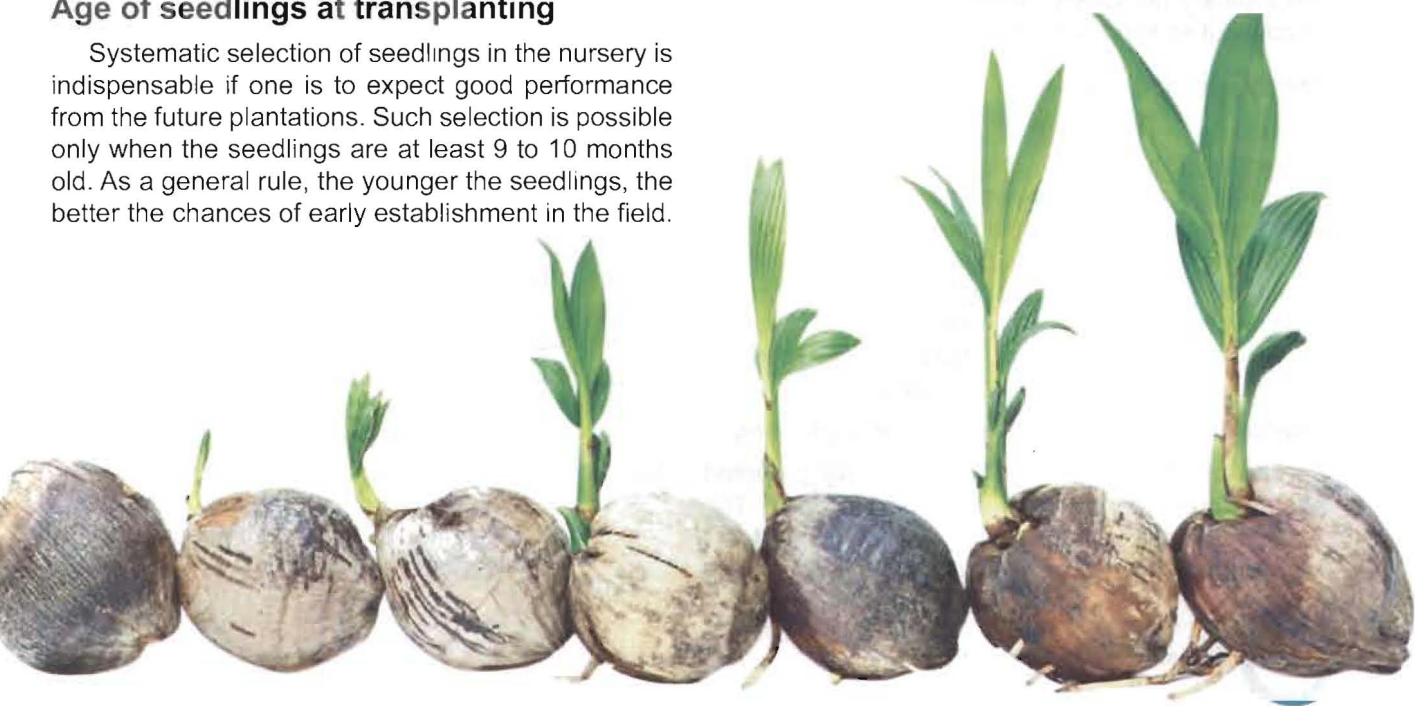
Systematic selection of seedlings in the nursery is indispensable if one is to expect good performance from the future plantations. Such selection is possible only when the seedlings are at least 9 to 10 months old. As a general rule, the younger the seedlings, the better the chances of early establishment in the field.

At the younger stage enough reserve food material would be available in the nut for being utilized by the growing seedlings. At about seven to nine months the seedlings will have 45 to 50 per cent of the kernel still left in the nut.

Consequently, the transplants can tide over the initial shock and the detrimental effects of root injury with less reliance on soil for nutrition. In the case of aged seedlings with lesser food reserve the transplantation shock and root injury will be considerable and will lead to delayed establishment in the field. Under ordinary conditions, seedlings of 9 to 18 months old can be considered the best for planting in most places. At this stage, the seedlings would have developed three to five fully opened leaves and a few roots with adequate availability of stored food in the nut. These seedlings do not wither quickly and being light in weight, are also easy and cheap to transport over long distances.

### Transplantation and care of the young seedlings

The area proposed for the plantation should be cleared and planting holes marked out at the appropriate places. The initial preparation of the land will depend upon the topography, soil type and the groundwater level. If the ground water level is high and the soil subject to water logging, the preparation of raised mounds or bunds may become necessary. The site should be fenced properly to prevent cattle trespassing.





## Planting

Different standards of spacing are adopted for the coconut crop in the major producing countries, with local variations within countries.

The choice of a spacing standard for the coconut depends upon whether the crop is grown as monoculture or in association with other crops, whether perennial or seasonal in character. In monoculture, spacing is adjusted in such a way as the fronds of the adjacent palms do not overlap when fully grown with the result that maximum sunshine is available for the palms to grow properly.

When other crops are also planted in association with the coconuts, the spacing should be wide enough to enable sufficient light to reach the lower storey.

Different spacing advocated were (1) triangular planting at a distance of 10 m giving 115 palms per ha or approximately 47 palms per acre, (2) a spacing of 9.1 m on the triangle giving 138 palms per ha. and (3) a spacing at 75 palms per acre or 187 palms per ha. In India, the general recommendation for pure stand coconut is 7.5 to 9.0 m on the square or triangle for the ordinary tall variety. Another useful development in coconut spacing is the hedge planting method.

## Methods of Planting

Among the different methods of planting advocated for coconut, the square and triangular methods are the most common and widely adopted. In monoculture, the triangular method is advisable as it will accommodate about 15 per cent more palms in a unit area at a given spacing. When intercrops are grown the hedge method is more desirable, because it facilitates penetration of more sunlight besides offering comparatively little room competition.

### *The planting pits and the technique of planting*

The planting holes or pits are usually prepared two to three months prior to transplantation. The usual practice is to burn organic refuses in the pit and char the sides to prevent termite attack. A planting

hole of 1.3 m cube is found necessary in hard laterite soils. In light soils where the water table goes down very deep during summer, planting holes of 1 m cube are recommended, where as shallow planting holes are adopted in areas where the water table is comparatively high. The seedlings are planted in small holes dug at the centre of the pits in such a way that the top of the husk of the seed nut is just visible outside. The soil around the seedlings should be firmly pressed, but should not be allowed to cover the collar of the seedlings nor get into the leaf axils.

## Time of planting

The planting season depends upon the climatic conditions. The proper time in India will be with the advent of the monsoons ie from May to June and from October to November. Planting before the monsoon with adequate provision for shading and watering has been found to facilitate early and better establishment of seedlings.

## Care of young palms

It is only by bestowing proper care and attention during the early stages the palms can be made to bear early and well. The seedlings should be protected from stray cattle till they attain sufficient height. The surface water should be diverted and the pits should be cleared of rain water as often as possible. During summer the seedlings should be shaded properly. It is equally important to keep down the weed growth around the seedling. A circle of about 1 to 2 m in radius should always be kept free of weeds and the area mulched with the dried weeds or any other organic mulches. Mulching conserves soil moisture and also regulates soil temperature. As the palm grows, the size of the circle can be increased or the entire garden can be ploughed or dug up. At the end of the first year, the gaps caused by loss of seedlings should be filled up. Similarly all the unhealthy and defective seedlings should be removed and replanted by good, fresh planting. The process may have to be continued up to five years after transplantation. Since the newly transplanted seedlings take more than five years to flower, some income can be obtained by cultivating suitable intercrops during this period. Termites, rhinoceros beetle mealy bug, red palm weevil, leaf rot and rodent are the common pests and diseases found to affect the young seedlings. The seedling should be inspected frequently and prompt control measures need to be taken if affected by any of the pests or diseases. ■