

# ARECANUT CROP MANAGEMENT



**CENTRAL PLANTATION CROPS RESEARCH INSTITUTE**  
(Indian Council of Agricultural Research)  
**KASARAGOD 671 124, KERALA, INDIA**



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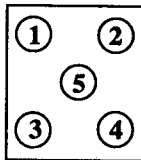
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***Photo***

Front cover : High yielding Sumangala palm

Back cover :



1. Base opening in arecanut
2. Fertilizer application in arecanut
3. Drip irrigation in arecanut
4. Areca+Cocoa mixed cropping
5. High Density Multispecies Cropping System

***Cover design***

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# ARECANUT CROP MANAGEMENT

Arecanut (*Areca catechu* L.) or betelnut is an extensively cultivated tropical palm, the nuts of which form a popular masticatory in India and West Asia. The cultivation of arecanut is mostly confined to 28° north and south of the equator. It grows well within the temperature range of 14°C and 36°C and is adversely affected by temperatures below 10°C and above 40°C. Due to its susceptibility to low temperature, the palm do not come up at an altitude of more than 1000 m MSL.

The major arecanut growing countries are: India, Sri Lanka, Bangladesh, Malaysia, Indonesia and Philippines. India leads the world in production followed by Sri Lanka and Bangladesh. In our country, arecanut is cultivated in about 3.72 lakh ha with a production of 4.15 lakh tonnes of nuts as per the 1998-99 statistics. More than 16 million people in different parts of the country, particularly those in Karnataka, Kerala and Assam are dependent on arecanut industry for their living.

Being a perennial crop, it is important to understand the principles of growing arecanut before setting up a new areca garden.

## Nursery techniques

Arecanut is propagated only through

seeds. So, great care is required in selecting the seeds and raising them in the initial years. There are four important stages in the selection and raising of arecanut seedlings. They are:

### i) Selection of mother palms:

The criteria for the selection of mother palms are: early bearing nature, stabilised yield, regular bearing habit, high percentage of fruitset and about 8-9 leaves on the crown per palm with shorter internodes.

### ii) Selection of seednuts:

The criteria for the selection of seednuts are: fully ripened nuts with weight of above 35 g should be selected and harvested without dropping to the hard soil for higher percentage of germination. The nuts selected should float vertically in water. These nuts produce the seedlings of greater vigour.

### iii) Selection of proper techniques in raising the seedlings:

a) **Primary nursery:** For obtaining good germination, the seed nuts should be sown as whole fruits. Under Vittal conditions, the mean number of days required for commencement and completion of germination are 53 and 94 days respectively.

The number of days required for germination increases with the altitude.

The nuts should be sown immediately after the harvest in soil or sand and watered daily to get early and good germination. The nuts should be sown at 15 cm distance in vertical position with calyx end just covered. The beds may be mulched lightly using areca leaf or paddy straw.

**b) Secondary nursery:** After six months in primary nursery, the seedlings are transplanted to secondary nursery beds of 150 cm width, 15 cm height and convenient length. A spacing of 30 cm between the seedlings is considered to be optimum for a growth period of one year in the nursery. Polythene bags (25x15cm, 150 gauge) filled with potting mixture (top soil:FYM:sand = 7:3:2) can also be used to raise secondary nursery. Sprouts of 3 months old should be used. The secondary nursery should be given a basal dose of decomposed farm yard manure @ about 5 tonnes per ha.

Areca sprouts and seedlings are very delicate and do not withstand exposure to direct sunlight. Hence, proper shade should be provided to the nursery. The shade may be either of coconut or arecanut leaves spread over a pandal or by planting some fast growing green manures or banana. The

nursery should be watered regularly in the summer and proper drainage should be provided in rainy season. The nursery should be kept clean by periodical weeding.

#### **iv) Selection of seedlings:**

Twelve to eighteen month old seedlings are transplanted in the main field. Seedlings with maximum number of leaves (five or above), minimum height and maximum girth are to be selected for planting. The selected seedlings should be removed with a ball of earth adhering to the roots for planting.

#### **Field management**

##### **i) Spacing:**

The optimum spacing for transplanting arecanut was found to be 2.7 m x 2.7 m. The seedlings may be planted with a ball of earth in 90 cm cube pits after filling half portion with top soil. While digging the pits, the rows may be aligned in north-south direction by deflecting the north-south line at an angle of 35° towards west to minimize sun scorching.

##### **ii) Planting season:**

Planting of seedlings is done either in May-June or September-October, depending on the intensity of rain. In river banks, where there is likely danger of inundation, it is advisable to plant at the end of the south-west

monsoon in the month of September. In other places, where the south-west monsoon is not severe, planting may be advantageously done in May-June.

### iii) Manuring and cultural operations:

Annual application of 100 g N, 40 g P<sub>2</sub>O<sub>5</sub> and 140 g K<sub>2</sub>O in addition to 12 kg each of green leaf and compost per palm per year is recommended. The fertilizers may be applied in two split doses once in May - June and another in September and the organic manures are applied during September-October in basins around the base of each palm. After the application of first dose of fertilizers and manures, a light digging is given to the garden and the basins of the palms may be covered with thick layer of soil for incorporation of manures and fertilizers with the soil. Weeding may be done as and when required. The weeds collected can also be incorporated into the areca basins.

### iv) Organic matter recycling:

On an average, 5.5 to 6.0 tonnes of wastes are available from one ha of areca garden per year. This can be effectively used as organic source of nutrients for areca plants. But direct application of these wastes in the garden will take long time for decomposition and will not meet the nutrient demand of the crop immediately. Hence, these materials can be

composted using earthworms effectively and used as organic manure in areca gardens. To prepare vermicompost, areca wastes are chopped into small pieces of 10 cm and heaped. The heap is sprinkled with water daily and kept for two weeks. Then the chopped material is arranged in beds of one metre width and convenient length. Cement tanks or trenches can be used for this purpose. A layer of 10-15 cm waste material is alternated with 2 cm layer of cowdung over which earthworms are released at the rate of 1000 numbers per square metre. The wastes are converted into fine granular, odourless vermicompost within 60 days. During this period, the earthworm population is doubled. About 8 kg/palm/year of vermicompost meets the crop nutrient demand. The two cultured species of earthworms *Eudrilus eugeniae* and *Eisenia foetida* can be used.

### v) Water management:

Arecanut cannot withstand drought for a long time. Being a perennial crop, once affected by water stress, it may require two-three years to regain the normal vigour and yield. The death of palms due to moisture stress is also not uncommon.

In West Coast of India, where more than 50 per cent of arecanut is cultivated, rainfall is mostly confined to June-November

months. Monsoon is followed by a prolonged dry spell normally extending from November to May. Excess evaporation, faster rate of wind speed, greater vapour pressure gradient in the above ground atmosphere and rise in temperature are the regular features of summer in these regions and as a result, the crop is invariably subjected to drought conditions. If the monsoon is delayed, the drought situation further aggravates. Therefore optimizing the irrigation requirements and also economizing the irrigation water assumes major importance in arecanut cultivation. At Vittal conditions, irrigation intervals of 5 and 10 days were found superior throughout the season. When irrigation treatments were based on IW/CPE ratio, the results showed that irrigation of 30 mm of water when the CPE is 30 mm is optimum i.e., with IW/CPE ratio of 1 with 30 mm of water. This works out an irrigation frequency of once in 7-8 days during November-December, once in 6 days during January-February and once in 4-5 days during March-May. The quantity of water to be applied is about 200 litre per palm.

During the summer, majority of the farmers face scarcity of water and it will be difficult to supply the required water to the palms. To overcome this problem, new irrigation methods were tried which can save

water without affecting the yield of arecanut. They are sprinklers and drip irrigation methods. Sprinkler method can save water up to 20 per cent of the water requirement in the traditional method of irrigation. Drip irrigation can save up to 44 per cent water as compared to the traditional method of irrigation i.e., flooding and splashing. About 20 litres of water per day per palm is to be given through drip irrigation. Three to four drippers/microtubes should be placed in the basin at 50 - 60 cm away from the trunk.

**Fertigation:** Application of nutrients through irrigation water is called as fertigation. This procedure can be profitably followed in arecanut.

#### **Advantages of fertigation**

- a. Nutrients can be supplied as per the crop growth, stages and demand of the crop.
- b. Nutrients can be supplied uniformly to all the plants.
- c. Since the nutrients are applied in the area of highest root activity and at optimum soil moisture, the nutrient availability and nutrient absorption by the roots will be improved.
- d. As the method is simple it saves time, labour and energy.
- e. Only a small quantity of fertilizer will be available in the soil. This avoids losses of nutrients through leaching and erosion.

- f. Saving in quantity of fertilizers to the extent of 20-40%.
- g. The fertilizer use efficiency will be increased due to the easy availability, reduced losses and increased yield.
- h. This method can be used effectively to grow the crops in soils, which have low nutrient and water holding capacity.

#### **Criteria for applying fertilizers through drip**

- \* Should avoid corrosion
- \* Should be soluble
- \* Should not react with salts or other chemicals in irrigation water.

#### **Fertigation methods**

- a. By using the main pump
- b. By using a separate small pump
- c. By using a fertilizer tank placed above the main irrigation tank
- d. Ventury

#### **Sources of nutrients**

- Urea is the widely used fertilizer for N fertigation.
- For Phosphorous fertigation, quality of irrigation water is important. Phosphoric acid and DAP are considered best for fertigation.
- Muriate of Potash and Potassium Sulphate are widely used for potassium fertigation.

#### **vi) Drainage:**

In order to ensure that adequate drainage is provided, it is essential that the drainage channel is dug for every two rows of palms. The channel should be at least 15-30 cm deeper than the depth at which the seedlings are planted. At the beginning of the monsoon, these drains are to be cleaned to have an easy flow of water. Even the planted pits should be provided with outlets and linked to drains.

#### **vii) Shading:**

During hot weather, the growing seedlings may be protected against exposure to sun by providing artificial shade of either arecanut or coconut leaves or by raising a shade crop of banana.

### **ARECANUT BASED CROPPING SYSTEM**

The long pre-bearing period, low returns during the initial bearing stage, fluctuations in market prices, unexpected loss due to pests and diseases and natural calamities are some of the problems associated with arecanut cultivation. To overcome these problems farmers started growing crops like banana, betelvine, pepper, tapioca, colocasia, dioscorea, pineapple and even coconut and jack to realise some income during juvenile phase of arecanut. This practice of growing crops along with the arecanut palms is called

mixed/intercropping. Central Plantation Crops Research Institute started a scientific study of inter/mixed cropping during 1970s and High Density Multi Species Cropping System during 1980s with the objective of increasing productivity per unit area and maximising the economical returns.

### **Scope for mixed cropping**

Approximately 60 per cent of the light is intercepted by an adult areca palm. By growing intercrop, the level of light interception could be increased to about 95 per cent. The root distribution studies in arecanut have revealed that at the recommended spacing arecanut uses only about 35 per cent of the space. Remaining 65 per cent of the space is not effectively used and this can be used for raising mixed/intercrops. In arecanut and cocoa mixed cropping, the higher litter fall and prunings of cocoa improves the organic matter content, soil fertility and increased microbial activity.

The large number of experiments conducted at CPCRI Regional Station, Vittal and other centres have indicated the need to observe some precautions while practicing inter/mixed cropping. The crop chosen should not have any problem of soil exhaustion and pest build-up. At the same

time, it should have maximum production potential and give maximum returns per unit input to the farmers. Crops, which love shade or those which can withstand the canopy of arecanut palms and heavy dripping during the monsoon are to be preferred. The choice of intercrops also depends upon the locality.

A large number of annuals, biennials and perennial crops have been tried in areca gardens to evolve suitable crop combination at CPCRI Regional Station and the Research Centres spread over the states of Karnataka, Kerala, Assam and West Bengal. Crops like banana, pepper, cocoa, elephant foot yam, citrus, betelvine, pineapple etc. were found suitable for mixed cropping in arecanut. However, it is found that as the age of the garden advances, only few crops can be grown profitably as mixed crop viz., pepper, cocoa, banana, lime and betelvine. The intercrops, apart from giving additional income, create additional employment opportunities.

### **Crop husbandry**

Following are some of the important cultural practices for intercrops. The summary of crop husbandry for intercrops is given in Table 1.

**Table 1. Crop husbandry for mixed crops in arecanut garden**

Crop	Spacing (m x m)	Population/ ha	Fertiliser (g/palm/year)			FYM (kg/palm)
			N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
Areca nut	2.7 x 2.7	1300	100	40	140	10
Black Pepper*	2.7 x 2.7	1300	100	40	140	..
Banana†	2.7 x 5.4	650	160	160	320	20
Cocoa†	2.7 x 5.4	650	100	40	140	..
Lemon†	2.7 x 5.4	650	300	250	500	20
Betelvine*	2.7 x 2.7	1300	100	40	140	10

\* Planted at the base of the palms; † Planted at the centre of four palms.

### i) Banana

Disease free, sword suckers of two to three months age are planted in pits of 50 cm cube filled with 10 to 12 kg of cattle manure at the centre of four areca palms. Recommended dose of fertilizer is 160 g N, 160 g P<sub>2</sub>O<sub>5</sub> and 320 g K<sub>2</sub>O per plant per annum. Fertilizer is applied in two splits i.e. half of the dose is applied two to three weeks after planting and the other half, four to five months after planting. Only one or two good suckers should be allowed to grow. Besides the main crop, two ratoon crops can be harvested over a period of three years and at the end of three years, the entire crop will have to be replanted in pits dug at changed sites. Banana can yield as much as 10 tonnes per ha, when intercropped with areanut. Banana varieties Malbhog, Chinichempa are suitable for West Bengal. Varieties Kadali, Mysore, High-gate, Karpuravalli, Poovan and

Nendran are suitable for Karnataka where as Mysore, Pooven, Karpuravalli, Robusta and Nendran are suitable for Kerala. The study to investigate the long-term effect of banana on areca nut at CPCRI RS, Vittal did not show any adverse effect of banana on areca nut yield.

### ii) Pepper

Pepper is grown in areca nut garden using areca palms as the standard. Two rooted cuttings are planted in the pits of 50 cm cube size on the northern side of the areca palm dug at a distance of 75 cm. As the vines grow the shoots are tied to the palms as often as required. The vine should not be allowed to touch the areca nut fruit bunches. Manuring at the rate of 100 g N, 40 g P<sub>2</sub>O<sub>5</sub> and 140 g K<sub>2</sub>O is to be done for adult vines every year in two equal splits during May and September. One third of the full dose is given during the first year, two thirds during second

year and full dose from the third year onwards.

Pepper begins to yield in the third year and comes to full bearing by seventh year. Harvesting of the spikes is done when two to three berries in a spike turn red in colour. The berries are separated manually and dried in the sun for 7 - 10 days till they turn black in colour. The recovery of black pepper is between 25-33 per cent depending on the varieties. On an average 1 kg dry black pepper can be obtained from a vine. Research results at Vittal have indicated that Karimunda and Panniyur -1 varieties are more suitable for cultivation as mixed crop in arecanut gardens.

### iii) Cocoa

Cocoa grafts or three to four month old seedlings of cocoa are planted in alternate rows at a distance of 2.7 m to give a spacing of 5.4 m x 2.7 m. One hectare of arecanut garden planted at a spacing of 2.7 m x 2.7 m in the square system will accommodate 650 plants of cocoa.

Pits of size 60 cm cube may be dug and have to be filled up to half with a mixture of 15 kg FYM and top soil. The planting of cocoa seedlings can be done before or after the monsoon. Adult cocoa trees require a fertilizer dose of 100 g N, 40 g P<sub>2</sub>O<sub>5</sub>

and 140 g K<sub>2</sub>O, which is to be applied in two equal splits in May and September. The fertilizer is to be broadcast at the base of the plant up to the radius of 75 cm and forked into the soil. One third of the full dose is to be given in the first year, two thirds in the second year and full dose from third year onwards. Cocoa is to be pruned and shaped to get a canopy at a height of 1.5 to 2.0 m. The average unrestricted height of cocoa is 6 to 8 m, but by pruning it can be restricted to less than 3 m allowing only a single storey of fan branches. Cocoa flowers from second year onwards and the pods take about 140 - 160 days to mature and ripen. When the pod colour changes to yellow, harvesting is to be done with the help of a sharp knife, without damaging. Cocoa bears round the year though two peaks are seen around June and December. On an average, 20 kg pods per tree are produced in an year. About 10 pods give 1 kg wet beans and 3 to 4 kg wet beans give 1 kg dry beans.

### iv) Other crops

Lemon and betelvine can also be grown as mixed crops in arecanut gardens in Maidan parts of Karnataka and West Bengal. In West Bengal, lemon variety Gandh-Raj is suitable while seedless variety of lemon can be grown in Maidan parts of Karnataka.

Betelvine variety Gaachpan is suitable for West Bengal.

### High Density Multi Species Cropping System

Research revealed that by growing only one mixed crop in arecanut gardens, we would not utilize the resources to the full extent. This left scope for taking more than one crop in the arecanut gardens as mixed crops. The system of growing more than one crop in a high density of planting in a unit area is called High Density Multi Species Cropping System (HDMSCS). Research efforts at CPCRI RS, Vittal and CPCRI RC, Hirehalli and Mohitnagar revealed that banana, cocoa, pepper, lemon, betelvine, elephant foot yam and tapioca can be grown with arecanut as HDMSCS. At Vittal, cultivation of cocoa, banana and pepper was found profitable with arecanut.

At Hirehalli, cocoa, pepper, banana and lemon were found profitable where as at Mohitnagar, a combination of arecanut, banana and pepper increased the net profits. By following HDMSCS, we can increase the net returns by 2.0 to 2.5 times over arecanut alone. Efficient cropping systems models for different regions are given in Table 2.

### Harvesting and processing

Harvesting of nuts at correct stages is very important for obtaining the produce of better quality. In chali preparation, only ripe nuts are harvested. The out turn of Patora and Koka will be more if unripe or under-ripe nuts are harvested resulting in low price in the market. After harvesting, the ripe nuts will have to be sun-dried for about 40-45 days. It is necessary to spread the nuts uniformly in a single layer for drying. Proper

**Table 2. Efficient cropping models for different regions**

Sl. No.	Region	Cropping Model	Net income (Rs/ha)
1.	Maidan parts of Karnataka	Arecanut+pepper+cocoa	1,98,000
2.	Maidan parts of Karnataka	Arecanut+banana+acid lime	1,78,000
3.	Coastal Karnataka and Kerala	Arecanut+pepper+cocoa+banana	2,69,000
4.	North Bengal	Arecanut+pepper+banana (or) Arecanut+pepper+acid lime	1,95,000
5.	Wynad district of Kerala and Uttara Kannada district of Karnataka	Arecanut+cardamom	3,05,000

drying of nuts is important to prevent fungal infection of the nuts in the drying yard. Turning of nuts once a week may be done for uniform drying and better quality of produce. If the requirement for the market is tender

processed nuts, then harvesting green fruits at an appropriate stage of about 6 months maturity is essential since produce prepared from over-matured fruits fetches lower price in the market.

\* \* \*