

PACKAGE OF PRACTICES
FOR
ARECANUT



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I. Selection and raising of planting material

1-1. Mother palms selection: The importance of genetically superior planting material particularly in a perennial crop like arecanut needs no emphasis. One of the established methods of selecting such genetically superior planting material is to select palms possessing characters of heritability. Of the many mother palm characters studied, age at first bearing and percentage of nut set were found to be correlated with yield and having high heritability. Thus confining selection of seednuts to mother palms which commence bearing early as well as to those which give a high percentage of fruit set, the yield of the resulting plantation can be increased. For selecting mother palms which commence to bear early, the plantation should be kept under regular observation from the beginning and early bearing palms marked out. Selection of seednuts from such plants may be commenced after the yield of the plant is stabilized which normally takes 4 to 5 years from first bearing. The existing practice of selecting seednuts from high yielding mother palms alone also requires modification. The percentage of fruitset should be checked up based on the number of female flowers produced and fruitset obtained. Seednuts should be selected from palms which give more than 50 per cent fruitset.

1-2. **Selection of seednuts:** From the selected mother palms only fully ripe nuts should be collected. All undersized and malformed nuts must be rejected. Heavier seednuts within a bunch give higher percentage of germination and produce seedlings of better vigour than lighter ones.

1-3. **Raising Seedlings:** The selected seednuts are sown soon after harvest 5 to 6 cm. apart in sand beds under partial shade with their stalk ends pointing upwards. Sand is spread over the nuts just to cover them. The nuts are to be watered daily. Germination commences in about 40 days after sowing and the sprouts can be transplanted when they are about three months old. At this stage the sprouts might have produced 2 to 3 leaves.

Secondary nursery beds of 150 cm. width and convenient length are prepared for transplanting the sprouts. If banana is used as shade crop it should be planted in advance at a spacing of 2.7 m. \times 3.6 m. The sprouts are transplanted at a spacing of 30 cm. \times 30 cm. with the onset of monsoon. A basal dose of well decomposed cattle manure at the rate of 5 tonnes per ha may be applied in the secondary nursery. Partial shade to the seedlings can also be provided during summer by 'pandals' or growing *Coccinia indica*. Crops such as banana and *Coccinia* provide not only shade but also give good returns to the grower. Care should be taken to drain the nursery beds during monsoon and to irrigate them during the dry months. Weeding and mulching should be done periodically. The seedlings are ready for

transplanting to the mainfield when they are 12 to 18 months old. Selected seedlings are removed with a ball of earth for transplanting. The seedlings can be transported over long distances after wrapping the roots and the attached soil in plastic bags. Judicious selection of seedlings at the time of planting and at later stages can ensure higher yields of new plantations. For planting, seedlings having 5 or more number of leaves should be selected. It is advisable to reject plants which have less than 20 cm. girth size one year after planting and less than four nodes two years after planting to ensure that only vigorous plants are left in the new plantation.

2. Raising garden

2-1. **Site selection and planting:** Arecanut is essentially a tropical crop grown on a variety of soils. The site selected should have adequate irrigation facilities, the soil should be deep, well drained, and without high water table. Being very susceptible to sun-scorch, arecanut palms need adequate protection from exposure to the south-western sun. Proper alignment of the plantation will minimise scorching of the stem due to sun. In the square system of planting at a spacing of 2.7 m. \times 2.7 m. the north-south line should be deflected at an angle of 35° towards west. The outermost row of plants on the southern and south-western sides can be protected by covering the exposed stem with areca leaves or leaf sheaths or by growing tall and quick-growing shade trees..

Pits of 90 cm. × 90 cm. × 90 cm. size are dug 2.7 m. apart for planting seedlings. The seedlings are planted in the centre of the pit, covered with soil to the collar level and pressed around. Planting is done usually in the month of May-June in well drained soils but in clay soils subject to water-logging the planting can be postponed to August-September to obtain better establishment. A shade crop of banana can be raised with advantage which, in addition to giving protection to seedlings from sun-scorch, also gives good return.

2-2. **Manuring:** A steady and high yield will depend to a great extent on the availability of adequate supplies of plant nutrients in the soil throughout the life of the crop. In perennial crops like arecanut this problem requires special consideration since the crop will be in the field for several years. Since major arecanut growing areas are situated in regions of heavy rainfall, the soils are severely leached and eroded thus making them poor in plant nutrients.

Annual application of 100g N, 40g P_2O_5 and 140g K_2O in the form of fertilisers and 12 kg. each of green leaf and compost per bearing palm is recommended. Fertilisers like Suphala, Factamfos (20:20), ammonium phosphate, calcium ammonium nitrate, rock phosphate, superphosphate, bone-meal and muriate of potash can be used to supply the required quantity of nutrients.

Under rainfed conditions, half the quantity of fertilisers may be applied in March-April and the remaining quantity in September-October. Green leaf

and compost can be applied in single dose in September-October. For young plants full dose of green leaf and compost or cattle manure may be applied from the first year of planting itself, one-third the recommended quantity of fertiliser in the first year, two-thirds in the second year and the full dose from the third year onwards. Manuring during September-October is done in basins around the palm dug to a depth of 15 to 20 cm. and 0.15 to 1 m. radius. The second dose of fertilisers may be broadcast around the base of each plant after weeding and worked into the soil by light forking.

In many places arecanut is grown on acidic soils. In such places application of lime corrects soil acidity, increases the availability of plant nutrients, reduces phosphorus fixation in the soil, enhances the microbiological activity and supplies calcium, an essential plant nutrient. The lime requirement of each soil may be determined separately and the required quantity of lime broadcast around the basins preferably during the dry months and worked in.

2-3. **Irrigation and drainage:** The palms should be irrigated once in 3 to 5 days depending on the soil type. In southern districts of Kerala where arecanut is grown mainly under rainfed conditions irrigation along with manuring gives three times more yield than what is obtained by manuring alone. Adequate drainage should be provided during monsoon since the plants are unable to withstand water-logging. Drainage channels should be 25 to 30 cm. deeper than the bottom of the pits to drain excess water from the plots.

2-4. **Cultural operations:** A light digging may be required when the monsoon ends in October–November to break up any crust formed at the soil surface and to uproot weeds. Terracing will be required to prevent soil erosion on slopy lands. Weeding should be done periodically to keep the garden clean.

2-5. **Cover cropping:** Cover crops, in addition to supplying organic matter to the soil, prevent soil erosion. Leguminous crops are preferred to nonleguminous crops because of their ability to fix atmospheric nitrogen and enrich the soil. Of the different green manure cum cover crops tried, *Mimosa invisa* (thornless mimosa), *Stylosanthes gracilis*, and *Calapagonium mucunoides* have been found to be suitable for arecanut gardens. The optimum time for sowing of cover crops is the months of April–May when the pre monsoon showers will reduce the competition for soil water between the cover crop and the arecanut. The green matter can be cut and applied to arecanut palms by October.

2-6. **Inter and mixed cropping:** The long pre-bearing age of 5 to 8 years, the low income in the early period of bearing and the fluctuations in the market price of arecanut from year to year have forced the arecanut growers to take up intercropping in arecanut gardens. This practice helps the arecanut growers to get additional income and to cover the risk of poor yields from arecanut resulting from unfavourable weather conditions and incidence of pests and diseases.

The choice of intercrops depends on its ability to tolerate shade and to withstand the heavy dripping

from arecanut palms during monsoon showers. Also, the subsidiary crops should not compete with arecanut for their nutrient requirements. The crops which can be grown successfully in arecanut gardens without affecting arecanut yields are banana, cacao, pepper, pineapple, betel vine, elephant foot yam and guinea grass. Banana also provides shade to the young arecanut palms in the early years.

2-6(1) **Banana:** Banana suckers are planted in pits of 50 cm. × 50 cm. × 50 cm. size at a spacing of 2.7 m. × 5.4 m. when the spacing for arecanut is 2.7 m. × 2.7 m. The banana palms alternate with arecanut seedlings in every alternate row. A basal dose of 12 kg. of cattle manure or compost and 0.5 kg. of super phosphate may be applied followed by a first dose of 0.2 kg. of calcium ammonium nitrate or ammonium sulphate and 0.12 kg. of muriate of potash two to three weeks after planting and second dose two to three months later. An inter crop of banana thus grown is estimated to yield about 4500 kg of fruits per ha with a net income above Rs. 900.

2-6(2) **Cacao:** Cacao comes up well in arecanut gardens on the West Coast. A mixed plantation of arecanut and cacao can be raised adopting the quincunx method with a spacing of 4 m. × 4 m. for arecanut and the cacao plants occupying the interspace with the same spacing. In older plantations cacao can be planted at a spacing of 2.7 m. × 5.4 m. where arecanut spacing is 2.7 m × 2.7 m. Six to nine months old cacao seedlings are planted in pits of 90 cm. × 90 cm. × 90 cm. site filled

with compost. Both areca and cacao require shade during the summer in the first one or two years. Artificial shade may be provided or a shade crop of banana may be grown during the initial years. Subsequently, the shade cast by areca will be sufficient for the cacao plants. Each cacao plant is to be manured every year with 12 kg of cattle manure, 12 kg of green leaf and 100 g N, 40 g P_2O_5 and 140 g K_2O . The cattle manure and green leaf as well as half dose of fertiliser may be applied in September-October and the rest of the fertiliser in February-March. During the first year, the full dose of organic manures and half the dose of fertiliser may be applied. Irrigation and cultural practices as given to arecanut will meet the requirements of cacao. All the fan branches arising from the main stem of cacao plants are to be cut up to a height of one metre from the ground. Cacao trees flower during the second year after planting. The pods take five to six months to ripen. The beans are removed from the pod and cured and dried. The crop gives 700-1000 kg. of dried beans per ha. (For more details on cacao cultivation please refer CPCRI Extension Pamphlet No. E on "Package of Practices for Cacao")

2-6(3) **Pepper:** Pepper can be grown in arecanut gardens using arecanut palms as standards. Pepper cuttings are planted 30 to 35 cm away from the base of the palms avoiding the southern side of the tree. Cattle manure or compost is applied before the south-west monsoon at the rate of 8 kg. per vine, 0.5 kg. ammonium sulphate, 1 kg. superphosphate, and 100 g. muriate of

potash may be applied in the month of August or September. Pepper vine starts yielding from the third year. (For more details on pepper cultivation please refer CPCRI Extension Pamphlet No. 7E on "Package of Practices for Pepper")

2-6(4) **Elephant foot yam:** Seed material is prepared by cutting mature tuber into pieces, each weighing 0.75 to 1.0 kg. and having a small portion of the central ring or bud. These are planted in pits of 50 cm \times 50 cm \times 50 cm size. Two pits at a distance of 90 cm may be dug in the same row of arecanut palms planted at a spacing of 2.7 m \times 2.7 m. A basal dose of 5 kg of cattle manure, 75 g of super phosphate and 50 g of muriate of potash may be applied in each pit and mixed with soil. Also, 75 g of ammonium sulphate or calcium ammonium nitrate may be applied as basal dose and top dressing one month after planting. The planting is done usually in February-March and the crop can be harvested after nine months. Average yields of 12 tons of tuber per ha can be obtained fetching a net profit of about Rs. 1,500.

2-6(5) **Pineapple:** Pineapple can be grown as a profitable intercrop in arecanut garden in the early years. Trenches of 60 cm width and depth and about 125 cm length are dug between two arecanut palms for planting suckers. The plants are manured with 500 kg of ammonium sulphate, 275 kg of superphosphate and 335 kg of muriate of potash per ha in two or three split doses before and after the monsoon rains, over a basal dose of 15 to 20 tonnes of cattle manure per ha. As an intercrop in arecanut garden, pineapple can give upto 8,000 kg of fruits per ha fetching a net profit of about Rs. 1,000.

2-6(6) **Guinea grass:** The slips of this fodder grass can be planted in two rows 50 cm apart in the interspaces between rows of arecanut palms or on the edges of drainage channels. Application of cattle manure at the rate of 10 tonnes per ha as basal dose followed by top dressing with 200 kg. of ammonium sulphate or calcium ammonium nitrate per ha in two equal doses, at an interval of six months is recommended for this fodder-crop. The fodder can be cut 5-6 times in a year and average yields of 18 to 22 tonnes per ha can be obtained.

3. Pests

Arecanut palm is attacked by a few pests. Only in cases where the inflorescences and fruits are attacked there is a direct loss while damage to other parts such as leaves, roots and stem has only an indirect effect on the performance of the trees. Mites, spindle bugs, inflorescence caterpillars and root grubs are the major pests of arecanut.

3-1. **Mites:** Arecanut palms of all ages are infested by two types of mites namely the red mite (*Raoiella indica*) and the white mite (*Oligonychus indicus*). They colonise on the undersurface of leaves and suck the sap as a result of which the affected leaves lose their green colour, turn yellow and present a bronzed appearance. The leaves ultimately wither away causing severe damage to the plants. The mites multiply rapidly during the dry,

hot summer months. They are effectively controlled by spraying the lower surface of leaves with Dicofol (Kelthane) at a concentration of 186 ml. in 100 litres of water. The spraying may have to be repeated at an interval of 15 to 20 days if there is a recurrence of the pest. In addition to the above another species of orange coloured mite (*Dolichotetranychus*) also attacks the arecanut fruits. These mites harbour inside the inner whorl of calyx of tender nuts and feed voraciously on the sap causing nut shedding. These mites are controlled by spraying the bunches with Rogor 30 EC at a concentration of 1 ml. per litre of water.

3-2. **Spindle bug (*Carvalhoia arecae*):** This is another serious pest which multiplies rapidly when the monsoon ends. Colonies of nymphs which are pale yellowish green and adults which are reddish brown or black and red in colour live inside the top most leaf axil at the base of the spindle and suck sap from the tender spindle. As a result of the attack, the spindles fail to unfurl completely, often get slightly twisted and do not attain the normal size. The affected leaves show numerous linear dark brown necrotic patches. Shot holes are formed in the necrotic areas later. Severe infestation results in loss of vigour of palms and consequent death. Spraying the crown with BHC (250 g. 50% wettable powder in 100 litres of water) controls the pest effectively. The pest can also be controlled by filling the leaf axils around the spindle with 10 g. Phorate applied at three months intervals. The spraying may be repeated once a month if the incidence continues.

3-3. **Inflorescence caterpillar** (*Tirathaba mundella*): This pest is important because it attacks the inflorescence directly. The adult moths lay eggs in the holes made on the spathe by slugs and earwigs. On hatching, the caterpillars gain entry into the inflorescence through these holes and feed on the flowers inside. They clump the inflorescence into a wet mass of frass with the silky threads formed by them and take shelter therein. Inflorescence, infested by the pest can be located easily by an experienced person. The affected spadices do not open and the punctures made by the slugs at their bases indicate the presence of caterpillars inside. Such spadices should be forced open and sprayed with Malathion 50% EC at concentration of 2.5 ml. in 1 litre of water. Slugs which are predisposing factors for the severe incidence of inflorescence caterpillar can be controlled effectively by using baits of metaldehyde.

3-4. **Root grub** (*Leucopholis burmeisteri*): Root grub or white grub is a serious pest of arecanut palm. It possesses a characteristic soft 'U' shaped body with brown hairy legs. They feed voraciously on roots. They attack the tender roots first and then the older roots. The base of the stem is also infested by the grub in severe cases of attack. As a result the stem tapers, leaves turn yellow and fruits drop. Since the roots are eaten away, the palm becomes unsteady and succumbs to wind. The grub is a soil inhabitant and is generally found in low lying areas where high water table exists or water logging conditions prevail during rainy seasons. Good drainage should therefore be provided before any attempt is made in controlling the pest. The grubs are

effectively controlled by treating the soil with Intox-8 (Sandoz) at a concentration of 50 ml. in 100 litres of water. Before the insecticide is applied, the soil around the palm should be dug up to a depth of 10 to 15 cm. and the chemical applied evenly all round. Phorate applied at the rate of 8 g. per palm also gives effective control of the pest. The chemical may be applied twice a year, once in May before the onset of the south-west monsoon and again in September-October after the monsoon ends. The treatment must be repeated for 2 or 3 years consecutively to completely eradicate the pest.

4. Diseases

Arecanut is affected by a number of diseases causing crop losses to varying degrees. Some of them are seasonal while others are prevalent throughout the year.

4-1. **Koleroga** (*Phytophthora arecae*): Koleroga or *Mahali* or Fruit-rot causes direct loss of the nuts. The disease is prevalent during the south-west monsoon season in areas where high humidity with alternate sunshine and rains prevail. The affected nuts show water soaked patches on the surface near the calyx region in the beginning. These patches enlarge giving a dark appearance to the fruits. The affected fruits lose their natural colour and drop down. A felt of white mycelial mass develops on the fallen nuts. Once the fungus has gained entry into the fruit it is not possible to eradicate it. The disease can best be prevented by

spraying 1% neutral Bordeaux mixture. Two sprayings are normally necessary, one just before the onset of the south-west monsoon and the second 40 days later. If the monsoon is prolonged, a third spray may be required. Spraying of the bunches should be taken up on clear days. The fallen nuts should be removed and burnt lest they act as foci of infection for further spread of the disease.

4-2. **Bud rot:** The fungus which causes fruit-rot also causes bud-rot. The tender base of the spindle is first affected.

The colour of the spindle changes to yellow and then to brown and the spindle slumps. With a slight pull the spindle can be drawn out of the crown. The infection spreads to the successive whorls of leaves leading to their rotting and causing a foul smell. The leaves become yellow, droop and finally the crown drops off leaving the stem bare. The affected spindle and leaves are to be removed and destroyed. The rotten tissues are scooped off by making a longitudinal side split. The exposed healthy tissues are treated with Bordeaux paste or the crown drenched with 1% Bordeaux mixture. If the treatment is given in the early stages of infection the affected trees can be saved.

4-3. **Anabe** (*Ganoderma lucidum*): Anabe or 'Foot-rot' is another dreaded disease in the maidan and semimalnad areas of Mysore and in some parts of Tamil Nadu, Kerala and Assam. The infection is through roots and the fungus gradually passes on to the stem

portion. The size of the crown gets reduced, leaves droop down and the palm presents a sickly appearance. At times a gummy exudation light brown in colour, oozes out from the bottom of the trunk. The crown gradually dries up and leaves fall off one by one leaving the stem bare. Later, fructifications (fungal brackets) develop at the bottom of the trunk. Since the disease is severe in crowded and ill-drained gardens, improving the drainage reduces the incidence of the disease. Judicious application of wood ash and well decomposed farm yard manure will be beneficial. The diseased palms should be isolated from the rest by digging trenches all around the tree. The stumps of dead trees should be dug out and destroyed by burning. The soil may be drenched with Vitavax 0.1% or Aurcofungin sol. 0.03% mixed with copper sulphate 0.02% before planting healthy seedlings. Raising trees like Gold Mohur (*Delonix regia*) and Honge (*Pongamia glabra*) in the vicinity of the garden should be discouraged as these serve as collateral hosts of the fungus.

4-4. **Yellow leaf disease:** This is a very serious malady taking a slow but heavy toll of the palms in the southern districts of Kerala and some parts of Karnataka. Palms of all ages are affected. The cause of the disease is unknown. The yellowing of leaves progresses along the margin of the leaflets and is interspersed with green stripes. In advanced stages, necrosis of lamina takes place. The kernel which turns brown in colour is unsuitable for chewing. In advanced stages of the disease the trees die.

4-5. **Band:** Band or *Hidimundige* disease is prevalent in almost all the arecanut growing areas. The disease is characterised by the production of small, crinkled, thick and dark green leaves. The internodal length is also shortened and the stem tapers. In advanced stages the crown presents the appearance of a rosette. Palms of all ages are affected. Any impediment to the normal growth of the roots seems to be the main factor responsible for the development of the disease. In a majority of the cases the malady can be overcome by providing good drainage. Adequate plant protection measures against spindle bug, mealy bugs and scales should also be taken up. Also, an application of a 1:1 mixture of copper sulphate and lime in the basins at the rate of 225 g. per tree twice a year has been found to improve the condition of affected palms.

4-6. **Sunscorch:** Sunscorching and stembreaking might become severe if adequate preventive measures are not taken up. The surface of the stem exposed to the south-west sun shows scorching as a result of which the stem loses its turgidity and gets partially flattened. Later fissures develop resulting in ultimate breaking of the stem in strong wind. The palms can be protected from south-west sun by tying areca sheath or leaves. Palms showing fissures may be reinforced by tying split pieces of areca stem over such affected patches. Quick and tall growing trees may be grown on the south-western side of the garden to provide protection from the scorching sun. A proper alignment of rows adopted at the time of planting will help minimise the incidence of scorching.

4-7. **Collar rot of seedlings:** This is an important disease occurring in nurseries and newly planted gardens wherever water logging and poor drainage conditions prevail. These conditions permit the entry of soft rot bacteria which cause this disease. The base of the stem at the collar region rots and finally the seedling topples down. Soil borne fungi like *Fusarium* and *Rhizoctonia* are associated with the disease. Since the disease occurs in ill-drained nurseries and fields, improving drainage is a prerequisite in preventing the disease. In an affected nursery or garden the spindle and base of the seedlings should be drenched with a 0.1% solution of Ceresan.

4-8. **Die back of inflorescence:** Shedding of buttons due to die-back of inflorescences occurs during summer months. The symptoms of the disease caused by *Colletotrichum gloeosporioides* are browning of the rachis from the top and heavy shedding of set buttons. Later, concentric spots develop on the dried inflorescences. Since the dried inflorescences act as a source of inoculum, the affected inflorescences should be removed immediately. The disease can be controlled by spraying the inflorescences with Dithane Z-78 at a concentration of 4 g. in 1 litre of water. Two sprayings are normally necessary, one just after the setting of female flowers and the second after 15 to 20 days. Aureofunginisol mixed with copper sulphate at 50 ppm. concentration is also effective in controlling this disease.

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