Crops of Kerala – An overview
Gregor Mendel Foundation, Calicut University, Kerala, India (2018).

Biology and cultivation of arecanut

N.R. Nagaraja[1], K.S. Ananda[1] and M.K. Rajesh[2]
[1]ICAR-Central Plantation Crops Research Institute, Regional Station, Vittal - 574243, Karnataka, India.
[2]ICAR-Central Plantation Crops Research Institute, Kasaragod - 671124, Kerala, India.

Arecanut (*Areca catechu* L.) is one of the important commercial crops of South India, Konkan, Andaman & Nicobar group of Islands and North Eastern Region of India. In the world arecanut is mainly grown in India, China, Myanmar, Bangladesh, Indonesia, Sri Lanka and Thailand. Other countries where arecanut is grown are Bhutan, Nepal, Malaysia, Kenya, Maldives etc. India ranks first in the world both in area and production of arecanut. India is not only the largest producer but also the largest consumer of arecanut and it continues to dominate. India has nearly 50 percent of world arecanut area and contributes more than 56 percent of world production. As per the statistics available, In India arecanut is grown in an area of about 4.72 lakh hectares with production and productivity of 7.35 lakh tonnes and 1558 kg/ha in 2015-16.

In our country arecanut is mainly grown in Karnataka, Kerala, Assam, Meghalaya, West Bengal and Mizoram for its masticatory nuts popularly known as 'betlenuts' or 'supari'. Arecanut is also grown in other states like Andra Pradesh, Goa, Maharashtra, Tamil Nadu, Nagaland, Tripura, Pondicherry etc. Three Indian states namely, Karnataka, Kerala and Assam produce more than 85 percent of our countries' production. Arecanut plays a prominent role in the religious, social, cultural and economic life of people in India.

Arecanut, along with several other ingredients, is being chewed by many in several countries as it is believed to have numerous medicinal values. It has an important place in the alternate system of medicine such as Ayurveda, Unani and Homeopathy and in clinical practices in certain other countries such as Philippines, China and other South and South East Asian countries. The World Health Organization has listed out as many as 25 beneficial effects of *A. catechu*. It has also been reported that all the alkaloids present in arecanut possess drug like properties. Most of the folk medicinal properties of arecanut are now validated and authenticated with proper scientific data. It has antioxidant, anti-inflammatory, analgesic, anti-diabetic, hypolipidemic, antibacterial, anti-fungal, anti-malerial, anti-viral, anti-HIV and AIDS, anti-aging, memory improvement, wound healing, anti-ulcer, anti-migraine, antihypertensive, anti-depressant, anti-allergic, anthelmintic, aphrodisiac, hepatoprotective and cyto-protective effects. Arecanut plant parts are used for the preparation of household and other articles such as cups, plates, ply boards, hard boards, hats, etc. Arecanut extracts are used for preparation of areca

tea, soap, wine, etc. Arecanut leaf sheath is also used as alternate fodder for livestock.

Arecanut (*Areca catechu* L.) is a monocot belonging to the tribe Arecae and subtribe Arecinae in the Arecaceae family. The palm is an unbranched, erect, medium-sized, monoecious tree growing in hot and humid tropical regions of the world and its center of origin is considered to be South East Asia. The Areca palm, which is highly cross-pollinated, is an allotetraploid with chromosome number 2n=32. The genus *Areca* includes 76 species, *A. catechu* being the only cultivated species. It has been observed that there is a wide range of variation existing in plant morphology, size, shape and colour of fruits between the different areca growing regions and between different palms/ accessions of the same region.

Arecanut cultivation is mostly confined to 28º North and South of the equator. It grows well within the temperature range of 14ºC to 36ºC and is adversely affected by temperatures below 10ºC and above 40ºC. It can be cultivated up to an altitude of 1000 m above MSL in deep and well drained soils with low water table. Due to its susceptibility to low temperature, the palms do not come up at an altitude of more than 1000 m above MSL. Arecanut requires abundant and well distributed rainfall. Heavy rainfall and high relative humidity are the major constraints for arecanut cultivation in humid tropics. Heavy rainfall leads to leaching of potassium and calcium, while high relative humidity is congenial for development of pests and diseases. Arecanut is predominantly grown in gravelly laterite soil of red clay type and it can also be grown in fertile clay loam soils with special care of microsite improvement. Laterite, red loam and alluvial soils are more suitable for arecanut cultivation. Sticky clay and sandy, brackish and calcareous soils are not suitable for areca cultivation.

Planting material production

Arecanut is propagated by seeds. Being a perennial and cross pollinated crop, adequate care should be taken in selecting the planting material.

Selection of mother palms

Mother palms should be of more than 12 years age, regular bearers with early bearing nature (36-40 months after planting), with partially drooping or drooping crown with higher number of leaves (>10) and shorter internodes, with high fruit set (>55% set) with around 350-400 fresh nuts/ palm/year, with consistent yield of about 3 kg or more dry kernel (chali)/palm/year, with high recovery of chali from fresh fruit (>25%) and free from pest and diseases incidences. Mother palms are selected based on the requirements for processing, chali or tender nut.

Selection of seed nut

Seed nuts of three different types are preferred for seedling production viz., inter se, hybrid and open pollinated.

Inter se: Seed nuts produced after emasculation and pollination by using the pollen of selected palms of the same cultivar/ variety.

Hybrid: Seed nuts produced after emasculation and pollination between two different desired parents.

Open pollinated: Seed nuts harvested from selected mother palms of the desired cultivar/variety without any artificial emasculation (removal of male flowers) and pollination.

Fully ripened heavy nuts weighing more than 35 g will give better germination than lighter nuts and give more number of quality seedlings. The mature nuts should be harvested when at least a few nuts in the oldest bunch start falling. Normally it takes 11-12 months to become a mature seed nut after pollination. Rope harvest of seed nuts is recommended from trees

which are very tall and in places where the ground is hard. The nuts, which float vertically with calyx end pointing upwards in water will produce more vigorous seedlings. Harvested seed nuts can be stored only for about 3 to 6 days since the nuts are recalcitrant, i.e., viability will be lost soon.

Nursery techniques in arecanut

Primary nursery

Sowing the nuts immediately after harvest in soil/sand and watering will result in early and good germination. Selected seed nuts are sown with their stalk end pointing upwards, 5 cm apart in sand beds of 1.5 m width and convenient length. Thick mulching is to be done with straw/areca leaves. Beds are to be watered daily either by using hose or microsprinklers. Germination of nuts usually commences by 43 days and gets completed by 94 days.

Secondary nursery

For raising the seedlings in secondary nursery, beds of about 1.5 m width and 15cm height are suggested. A spacing of 30-45 cm is considered optimum for planting three months old sprouts in secondary nursery and repotting in poly bags is also preferred. The secondary nursery should be given a basal dose of decomposed farmyard manure or vermicompost @ 5 tonnes per ha. The nursery should be partially shaded to get good seedlings.

Polybag nursery

Seed nuts may be sown directly in poly bags of 6"x9" size and 250 gauge thickness, with holes for drainage. Potting mixture should be of Soil: FYM: Sand in the ratio 7: 3: 2. Well decomposed farm yard manure or vermicompost and sieved sand should be used for potting mixture preparation. Solarization of soil by covering with black polythene sheet and sun drying of potting-mixture for one week may be practiced to avoid any soil borne diseases. Daily watering during rainless period is needed to ensure desired growth.

Selection of seedlings

Seedlings of 1-1.5 years of age having six or more leaves (early leaf splitting), 90 cm height and 26 cm collar girth should be selected. Seedlings having more than 5 nodes after two years are the best seedlings to get better yield. The seedling should have well established root system with 5-8 main fibrous roots intact and active while transplanting. The seedlings have to be uprooted with a ball of earth adhering to roots if they are raised in nursery bed. Seedlings should be free from pests and diseases. Polybag seedlings are preferred for long distance transport. Care should be taken to prevent damage/breakage of seedlings at the collar region during transportation.

An area of 4,000 square meters is required to maintain 50,000 seedlings. 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 covering with 50-75% shade net (green or black) or by planting some fast growing green manures or banana around the nursery. The nursery should be watered regularly during summer and proper drainage should be provided during rainy season. Periodical weeding and mulching is required. Nursery can be raised in the interspaces of coconut plantation and also in widely spaced arecanut gardens. Sprinkler/micro-jet/hose irrigation systems are well suited to arecanut nursery beds/polybag seedlings.

Crop Improvement

In India, systematic germplasm collection of arecanut from within and outside the country began in 1957 and screening them under uniform conditions was initiated at the ICAR-Central Plantation Crops Research Institute (CPCRI) Regional Station, Vittal. The present germplasm

holding at ICAR-CPCRI Regional Station, Vittal is 176 accessions. Out of these 153 are indigenous eco-types of arecanut collected from different parts of India and 23 are exotic accessions introduced from Fiji, Mauritius, China, Sri Lanka, Indonesia, Saigon, Singapore, British Solomon Islands and Australia and the germplasm represents four species viz., *Areca catechu* L. *Areca triandra* Roxb., *Normanbya normanbyii* and *Actinorhytis calapparia*. The indigenous collections are from Gujarat, Maharashtra, Karnataka, Assam, Kerala, West Bengal, Tamil Nadu, Meghalaya and Andaman & Nicobar.

Identification and release of varieties

Increase in arecanut production over decades was not only due to increased area under cultivation but also increased productivity contributed by superior varieties, supply of quality planting materials, better agro-techniques and plant protection measures. Evaluation of available arecanut cultivars for their performance under different ecological conditions is a promising method of obtaining genotypes suited for the different regions of India. But arecanut palm is more sensitive to moisture stress than coconut and therefore its cultivation is restricted to areas with well-distributed rainfall or assured irrigation facilities. Based on the comparative yield trials of indigenous and exotic accessions, promising cultivars were selected and released as varieties for commercial cultivation.

The evaluation of exotic accessions and selection for high yield and its attributes, resulted in release of Mangala (introduced from China), Sumangala (introduced from Indonesia), Sreemangala (introduced from Singapore) and Swarnamangala (introduced from Vietnam). Evaluation of indigenous accessions resulted in the release of high yielding varieties like, Mohitnagar, Samrudhi, Sirsi Arecanut Selection-1, Kahikuchi, Madhuramangala, Nalbari and Shatamangala with high yield potential. Two dwarf hybrids namely VTLAH-1 (Vittal Arecanut Hybrid-1) and VTLAH-2 (Vittal Arecanut Hybrid-2) were also released. Most of these varieties/hybrids viz., Mangala, Sumangala, Sreemangala, Swarnamangala, Mohitnagar, Kahikuchi, Madhuramangala, Nalbari, Shatamangala, VTLAH-1 and VTLAH-2 were developed and released by ICAR-Central Plantation Crops Research Institute (CPCRI). Samrudhi was developed and released by ICAR-Central Island Agricultural Research Institute, Port Blair and ICAR-Central Plantation Crops Research Institute. University of Agricultural Sciences, Dharwad was responsible for release of Sirsi Arecanut Selection-1.

Hybridization in arecanut

In arecanut, hybridization starts with removing the portion of rachillae having male flowers (emasculation) soon after emergence of the inflorescence and covering the spadix bearing female flowers with a cloth bag. When the female flowers open, anthers from the desired male parent is rubbed against the stigma or the pollen is dusted on the stigmatic surface, by removing the bag. The bag is replaced over the inflorescence immediately after pollination. The process is repeated daily for about a week till all the female flowers in the spadix open and fruit set can be seen after 20 days. In artificial pollination, fully opened male flowers are collected from the selected palms and are transferred to a reagent bottle containing 0.5 per cent solution of sucrose and the bottle is shaken gently. The pollen grains thereupon get released in the aqueous solution. The solution with the pollen grain in suspension is transferred to an ordinary hand atomizer and sprayed onto newly opened female flowers. The spraying may have to be done three to four times, as all the female flowers do not open at the same time. About 14 per cent increase in fruit set

was obtained by this method and the same could be successfully used in commercial hybridization.

Dwarf hybrids of arecanut

Though tall varieties possess high yield potential, they are frequently prone to sun scorching, wind damage and also become difficult to manage. The tall nature of the palm hinders various operations like spraying and harvesting which are quite labour intensive and cumbersome. Arecanut breeding programmes are aimed at development of dwarf arecanut varieties/ hybrids in addition to yield improvement. Hirehalli Dwarf (HD) a natural mutant identified in 1963, for its short stature is a good genetic source for arecanut improvement. Dwarf hybrids with high yield potential will directly benefit the growers by way of enhanced returns and reduced cost of various cultural operations like harvesting and spraying. Damages to palms due to sun-scorching and heavy wind will be the minimum. Therefore, the exploitation of dwarfing genes in breeding dwarf varieties with high yield potential was initiated. Hybrids involving Hirehalli Dwarf (HD) and released tall varieties as parents were developed and evaluated for yield performance and dwarfness. Among the hybrids, HD x Sumangala and HD x Mohitnagar were identified as superior for yield with dwarfness and recommended for commercial cultivation as VTLAH-1 (Vittal Arecanut Hybrid-1) and VTLAH-2 (Vittal Arecanut Hybrid-2), respectively.