

## A Study of Arecanut Production in South India

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Ranked as one of the principal commercial crops of South India, the arecanut (*Areca catechu*) has also been a very popular masticatory all over this country from times immemorial. Either by itself in its varied fresh or processed forms or in combination with the leaves of the betel vine (*Piper betel*), a little lime and sometimes with also pieces of clove, nutmeg, tobacco etc., the arecanut has become an almost invariable feature of Indian hospitality. "Pansupari" is the name by which this dessert or after-dinner masticatory is known all over India, representing perhaps the largest common factor in the dietary habits of the people of this sub-continent. In rituals and offerings too, the nut or inflorescence of the areca palm has gained for itself a great prominence in South Indian life, so that this crop is entitled to be reckoned as an essential part of the life and living of the inhabitants of this part of the country. A study of this crop and its production methods will have, therefore, an interest and value from the view points of the South Indian economy no less than that of the social life of the region.

**Historical.** Grist (1926) has stated that the betelnut which is synonymous with arecanut, has been a source of trade between India, Ceylon, Indonesia and Malaya from the remotest periods of history. The belief has been held that Malaya might perhaps be the original home of this nut. Sands, quoting from Ridley's book on "Flora of the Malay Peninsula" provides evidence to the contrary, since Ridley had never seen the palm in a wild condition in Malaya nor did it appear to establish itself outside cultivated ground, though he has recorded that the palm was under cultivation in Malacca before 1593. A more ancient reference to the palm is found in a Chinese work dated 140 to 80 B. C. under the name Pinlang, which is evidently a perversion of Pinang. The affinity of this term to "Penang nut" which is the name by which arecanut was widely known in Malaya Peninsula and Sumatra may be obvious. It seems also obvious from these and other facts that the palm was existing in Malaya and possibly in Philippine group of islands from historical times. Beccari, however, is definite that in no other part of Asia or Malaya, excluding the Philippines, was any species of areca found or any other species remotely similar to the *Areca catechu*. Till more



evidence comes to light, the original home of the palm as also the date of its introduction into India has to remain shrouded in mystery, the only possible surmise is that the nut was probably brought into this country by the Indian labourers for chewing purposes from the Philippines (4) or from Ceylon.

**Trade.** According to Grist, arecanut formed an important exported commodity from Ceylon to India and was the chief medium of exchange for the grain which the natives of Ceylon have for centuries drawn from Southern India. From the figures furnished from Calcutta (3) for 1918—1919, the foreign trade in this nut for the whole of undivided India was as under.

<i>Exports.</i>		<i>Imports.</i>	
Quantity	Value	Quantity	Value
3,62,419 lbs.	£. 8,119	142,527,683 lbs.	£. 1,141,269

The imports to Madras Presidency in recent years can be gauged from the following figures supplied by the Provincial Marketing Officer, Madras.

<i>Year.</i>	<i>Imports in Cwts.</i>	<i>Value in Rupees.</i>
1938—1939.	2,79,801	not known
1944—1945.	74,236	32,79,337
1946—1947.	1,41,629	more than a crore.

From the foregoing it may be concluded that the country is very much in deficit in respect of the nut, and there is therefore a very considerable headway to be made in stepping up the production. That even the leading areca producing province like Madras should be dependent on outside sources for her areca supply to the tune of more than a crore of rupees, is a feature that should set everyone thinking on the methods necessary for bridging the gap between the demand and production. In the case of a crop like areca, for the production of which, ideal conditions exist in South India, there is no possible reason why production cannot be augmented, not merely to make South India self-sufficient but also to cater to the huge demand in other parts of the country. This is a line of development that seem to deserve urgent consideration in our national crop-planning.

**Production.** The Provincial Marketing Officer, Madras, has estimated that the Madras Presidency produces annually, 5,45,150 cwts. of arecanut valued at Rs. 5,45,15,000 (1946—47). This is from an



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estimated area of 1,07,000 acres which works out to an acre yield of about 5 cwts. The figures of acreage under areca as furnished by the Special Officer, Arecanut Survey, Ernakulam, are presented below :

Assam	...	...	27,200 acres.
Bengal	...	...	5,700 „
Bombay	...	...	19,400 „
Cochin	...	...	24,400 „
Coorg	...	...	800 „
Madras	...	...	1,07,000 „
Mysore	...	...	37,100 „
Travancore	...	...	40,000 „
Other parts	...	...	1,800 „

Total ... 2,63,400 acres.

In acreage and money value, the areca occupies even at present an important place in the economy of this Province. Considering the need for the extension of production and the possibilities thereof, it would appear that areca is a crop that deserves more attention than that it enjoys at present. Such attention has to be based mainly through planting of additional area and by effecting improvements in production methods. It has to be noted that at present South India claims 79·5% of the total areca area in the country which fact entitles the crop to be deemed as of chief importance to this region. Any work designed to foster greater and better production of the area should, therefore, be conceived principally against the background of South India's peculiarities and potentialities.

Out of the total area of 2,63,400 acres of arecanut grown in the Indian Union, 1,07,000 acres are in Madras Presidency alone and 2,09,300 acres in South India including Cochin, Travancore, Mysore and Coorg, that is 79·5% of the total area. It has already been pointed out, how Madras is importing more than one crore of rupees worth of nuts every year and how important it is to make the province self-sufficient in arecanut. There is scope for tackling this problem both by increasing the area and improving the yield of the existing gardens.

It should be noted that practically no work has been done on the improvement of arecanut in India except the work to control "*Mahali* disease". As such there is practically no literature available



on the various aspects of the arecanut crop. It is time that serious attention is paid to the improvement of this important commercial crop and it is really good news that the Government of India have taken up the matter and appointed an Agricultural Officer to conduct a survey of the crop. It is hoped that a separate committee like the Indian Central Coconut Committee, will be started soon with research stations for the improvement of arecanut.

The areca palm is widely distributed in tropical countries where climatic conditions are suitable for its growth. It is grown in India, Ceylon, Federated Malay States, Straits Settlements, Sumatra, Java and other East Indian Islands.

**Uses of Areca.** The uses of the palm are many. The most important is the nut which is used chiefly as a masticatory by the people of Eastern races and with the natural increase in population the demand for the nut is steadily increasing.

Sands (1926) has recorded — "To the taste the nut is astringent and slightly acid; it possesses also narcotic and anthelmintic properties. These properties are due mainly to the alkaloid "Arecoline"; but three other closely allied alkaloids have also been isolated. The alkaloids are said to occur in the light coloured endosperm and not in the dark brown or red portions which contain the colouring matter."

The powdered nut owing to its astringent action on the gums is used as a dentifrice and in veterinary practices as an anthelmintic. The nut when boiled with water gives a decoction and this is used in the preparation of dyes. in tanning and in the preparation of catechu. The stem is used as rafters and pillars for sheds and also as fuel. The leaves are useful as fuel and the midribs for the preparation of brooms. The leafsheaths are used as plates and for the preparation of hand tans, caps, packing material etc. The roots are used in medicine (5).

**Description of the Palm.** For an understanding of the areca production methods, it will be useful to have an idea of the growth and fruiting habits of the palm.

The palm is unquestionably one of the graceful plants, with an appearance and dignity all its own. The sight of the areca plantations skirting the ghat road from Mettupalayam to Ooty is a sight never forgotten by those who enjoyed it. Even in a home garden or a park,

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the clean and supple stem rising to great heights with straight lines add a beauty which is an asset whether as individual specimen or in groups as in avenues.

Sands has recorded that the palm reaches a height of 60 feet but in South India much larger heights are not infrequently seen. The stem is cylindrical, 5 to 8 inches in diameter and ringed distinctly from the base upwards by the scars of the fallen leaves. The stem is green when young but assumes a greyish colour with age. The stem is tough and strong and is not readily broken by wind. It is held up by strong roots both above and below ground. The crown of leaves is compact with a diameter of about 8 feet. The leaves are pinnate from 4 to 6 feet long with a long sheathing base which completely encircles the stem. The leaflets are numerous, 1 to 2 feet long, 1 to 1½ inches wide, some of which may remain joined together.

**Flowering.** Under favourable conditions the palm commences flowering when it is about 4 years old. Each inflorescence or spadix is closely covered by a leaf sheath until a few days before it is ready to open. Further, the spadix is completely enclosed in a sealed, double boat shaped, flattened spathe about 2 feet long and 7 inches wide in its broadest part. The inner and the upper side of the spathe is much thinner and weaker than the outer and the lower side, so that the expanding spadix easily bursts the spathe open along its upper side in a central longitudinal line and frees itself.

The spadix is short stalked, 1½ to 2 feet long, with numerous branches and unisexual flowers. Each secondary or tertiary branch bears one to several female flowers near its thickened base; whilst an abundance of male flowers are produced on special filiform branches, 6 to 10 inches long, which arise below and extend beyond the female flowers. The male flower is small, 1/8 inch long, sessile, triangular, white, with three minute sepals and three larger, stiff, lanceolate petals. The stamens number six and contain very minute, colourless pollen grains. The rudimentary ovary is trifid and slightly longer than the stamens.

The female flower is 1/2 to 5/8 inch long, sessile, with three broadly imbricate green sepals, about as broad as long, and three ovate petals. At the time the flower is receptive the petals are creamy white and about 1/3 longer than the sepals. There are six minute flattened staminodes whose bases are joined together and encircle the base of the ovary. The ovary is surmounted by a thick trifid stigma which is situated immediately below the small opening formed at the tip of the flower by the petals.



Both the male and female flowers are very fragrant.

**Male and Female Flowering Phases.** The male and female flowering phases are different. The male flowers commence to open at the tip of each slender male branch and continue backwards towards its base in a fairly regular manner until all the flowers are exhausted. This phase lasts from three to four weeks. Near the end of the male phase the green petals of the larger female flowers commence to lengthen and change their colour. After the last male flowers have opened, the petals of the female flowers open slightly at the top and soon after the flowers become receptive and remain so for perhaps two or three days. Although the female phase definitely starts after the close of the male phase, the commencement of it, reckoning from the time of the opening of the flowers, has been found to vary considerably in different trees. In some instances the female flowers opened the day following the close of the male phase, while in others up to eleven days elapsed before they opened. The average time however was about four days.

The male flowers are visited by bees and other insects but no insect visitors have been seen on the female flowers. It would appear that pollen is carried by wind and so, are normally cross-pollinated. Only under exceptional circumstances can the flowers be pollinated by pollen from the same tree. This is an important point to show the difficulty in obtaining pure races of betel-nut under ordinary conditions. It has however been observed that young trees when growing rapidly under good conditions some times develop spadices in such quick succession that the male phase of the last opened spadix overlaps the female phase of the one immediately below, so that self-pollination is possible.

The fruit takes about eight months to ripen and when ripe is orange yellow or yellow in colour and consists of a thick fibrous outer layer, the pericarp, which encloses the single seed or nut. The hard endosperm which fills the seed is traversed by the dark wavy lines which give it a marbled appearance resembling the nut-meg. The red or reddish brown markings are due to the infolding of a dark inner layer of the seed coat into the light coloured endosperm. The embryo, situated at the base of the seed is fairly large and conical in shape. The size and shape of the fruits and nuts vary widely according to types.

**Varieties.** As in other cultivated plants, the betel nut palm has different types according mainly to the shape of nuts. A number of types is seen mixed in a plantation and it can be said that no plantation is of pure type. In South India we find two main types. (i) "*Siya Adike*" — *A. Catechu* — *Var. deliciosa* — not fibrous, less



tannin and smaller. (2) "*Rama Adike*" — *Actinorhysis Calapparia* — much bigger nuts, more tannin but not useful as the fresh nut is said to act as poison (5) The main type grown is the former. As betel nut palm is normally cross-pollinated and as there are numerous types in each plantation, it is difficult to decide which of these are pure types of varieties unless regular breeding experiments are conducted. The types noted in Southern India are Round Big, Round Small, Convex Shaped, Pointed Top, Narrow Base etc., according to the shape of the fruits. In Malaya Peninsula there is said to be a variety with fruits  $3\frac{1}{2}$  inches in length and  $2\frac{1}{4}$  inches in diameter thickness — round and long fruit.

**Production Practices.** Areca palm is confined almost entirely to the moist tropical tracts that fringe the coast line and it is seldom found more than 200 miles away from the coast. It is often seen in moderate elevations on mountains as on the slope of the Western ghats. It flourishes well in hot, moist, rich alluvial soil and in well-drained, rich peaty soils on the slopes of hills. The main point is that it requires a rich soil which retains moisture in summer and is well drained to drain off excess water in the rainy season. "A suitable piece of land is one which lies in a valley in the malnad and under a tank or in a fertile area in the fields of the maidan tract" (5).

**Seed Selection.** At present seeds for planting are selected by observing the following points :

- (i) Strong and vigorous trees which are 30 to 40 years old or even older are chosen as seed parents.
- (ii) The embryo of the nut must be small and exactly in the centre of the nut.
- (iii) The nut should be medium with a fairly large quantity of tannin.
- (iv) The shell must be thin, apex pointed and the bunch large.
- (v) Nuts are selected from bunches that mature in November. (5)

It is also said by experienced ryots that oval round nuts should be selected from old trees which are regular good bearers.

**Nursery.** The seed nuts are gathered when fully ripe, dried for a day or two and then planted in well-manured, raised beds close to one another. It takes about  $1\frac{1}{2}$  months for the nuts to germinate. After three months from planting they are transplanted in well-manured nurseries  $1' \times 1'$  or  $1' \times 1\frac{1}{2}'$  according to the time they are to be kept in the nursery.



**Planting.** Pits (2 feet cube) are generally dug in summer 8' x 8' or 8' x 10' apart and left for weathering for about a month. Well rotten cattle manure and green leaves are put into the pits and covered up. Drains, bunds and irrigation channels are all made to suit the particular plot of land. Plants  $1\frac{1}{2}$  to 3 years old as required, are planted in August—September.

**After Cultivation.** The plantations are given a yearly digging in August. Cattle manure and green leaves are applied liberally to individual trees, and drains and bunds repaired regularly.

**Irrigation.** It is a regular practice to irrigate the crop in most of the areas of South Kanara and in Mettupalayam but the palm is grown without irrigation throughout Malabar. This is one of the reasons for the poor yield in Malabar compared with that in South Kanara. Where irrigated, regular irrigations are given once in 15 days throughout the life of the plantation.

**Yields.** The harvest of the nut is done by climbers who are experts in climbing these palms and jumping from tree to tree. Yield of nut varies according to the region, the nature of the nuts harvested, the curing practices adopted etc., It ranges from 5 cwts. to 20 cwts. per acre, the average for South Kanara  $2\frac{1}{2}$  candies or 1400 lbs. of air dry nuts. The trees flower in about 6 years and normal yields are gathered from 8th to 10th year. The economical life of a tree is considered to be 40 years in South India. The tree is however said to live up to 75 years.

The flowering starts in January and the harvest begins in July-August and continues upto January. In the Malnad area of Mysore each tree gives two to three bunches on an average i. e., 800 to 1000, bunches per acre. Each bunch carries 200 to 250 nuts and so the total number of nuts will be 1,50,000 or 2,00,000 per acre. About 7,000 green nuts go to make one maund (28 lbs.) of the prepared product. Thus the yield per acre is 20 to 28 maunds (560 lbs. to 784 lbs.) of cured nuts. In South Kanara three to four bunches can be taken as the average giving 240,000 to 3,20,000 nuts per acre, the cured product being 1,200 to 2,240 lbs. per acre, as here the curing is of ripe nuts. Good yields are obtained in Mettupalayam where 3,50,000 nuts are obtained to give 1,000 lbs. of cured nuts (tender nuts cured). Milsum (1926) states "The mean yield of air dry nuts is 5.4 lbs. per palm in Malaya in an experimental farm at Serdang, the yield varying from 2.5 lbs. to 8.7 lbs. whereas on hill

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quartzite soil the yield of 1.5 lbs. per palm is the highest obtained (10 year old palms.) The average weight of a fresh fruit varies from 30 gms. to 78.5 gms. while the weight of the air dry nuts varies from 5.1 gms. to 14.6 gms. This shows the wide variations in the size of the nuts and the proportion of the pericarp. The yield of the fresh fruits is from 19 lbs. to 49 lbs. per tree, the percentage of air dry nuts being 13 to 24 % the average of fresh nuts being 32 lbs. and the average percentage of dry nuts being 17 %.

The heights of trees of all the types or varieties were measured 10 years after planting. Average height of the palms is 30 feet from ground level to the base of the petioles and a further 10 feet to the apex of the young leaves. Thus the average growth increase in these palms has been 4 feet per annum (6)

**Inter crops and Mixed crops.** It is usual to see other crops grown in areca gardens in Mysore and South Kanara where bananas are planted practically during the first year itself, in the alleys of the areca palm. About 400 suckers go per acre. In Mettupalayam banana is planted about 6 months earlier than the actual planting of the areca 8 feet apart and they are completely removed after 2 to 3 years and the areca garden is thereafter kept pure and clean. When banana is grown, a fair return is got from this crop, but the first bearing of the areca palm is delayed even up to 10 years, as the palms tend to grow slender and tall due to the shade of the banana crop. Even in old plantations in South Kanara banana is grown continuously as an inter crop. Pepper, betel vine and cardamom are also grown mixed in areca gardens. It is usual to grow coconuts, jack and bread fruit on the boundaries of areca gardens to provide wind breaks and shade to the garden as well as to give a further income from the yield of these trees. The economics of growing these crops as against a pure crop of arecanut is yet to be worked out.

Inter planting of arecanut in existing gardens or orchards is a common practice. As the trees die in areca groves, young seedlings are planted to fill up the gaps, and thus gardens of hundreds of years old are found in South Kanara with trees of different ages in the same plantation.

**Curing.** One of the main items of work in the cultivation of arecanut is the curing of the nuts for the market. It is either done by the merchants as in Mettupalayam and Malabar or by the cultivators themselves as in South Kanara. The process of curing



depends on the market to which the nut is to be exported. In Northern India, ripe, sun dried nuts are required, whereas tender processed nuts are preferred in the South. In South Kanara ripe nuts preserved in water are also largely used. There is no definite grade or standard for the cured product; the same kind of product is called by different names in different localities. The main methods of curing in some of the localities in the South are given below :—

**Mettupalayam.** Green nuts about a month before they are fully ripe are shelled whole by knife. The very ripe and too tender nuts are separated. The nuts are then cut into two halves cross-wise (harder nuts cut into four bits length wise) and boiled just covered with hot water. When the water just begins to boil which takes about 15 minutes the nuts are removed and immediately dried in the sun for a day. They are then coloured with a mixture of 1/4 part of syrup of decoction of areca and one part of one day's decoction, and dried again in the sun for three days. This product is called '*Kalipaku*'.

"*Dottepaku*" are the hard nuts cut into four pieces and cured as above.

"*Kurune*" are the tender whole nuts boiled, scooped out, dried, and treated with decoction as above and dried again.

The decoction is boiled for three days till a syrupy consistency is got and this is tinned and sold for preparing dyes and for use in tanning.

**Malabar.** At least 12 different varieties of cured nuts are known in this district :

1. *Aylam*. Tender nuts are husked, sliced and dried but not boiled. Under this there are the following according to the size of the nuts :  
(i) *Mullanki viravu* (ii) *Viruvu* (iii) *Mankapodi*  
(iv) *Ammanakri* (v) *Chitianam* (vi) *Poochittanam*.
2. *Nayam*. Nuts which are sliced thin and dried but not boiled.

The following are the sliced and boiled varieties :

3. *Levangacheer*. Cut into four longitudinal splits.
4. *Nukkalcheer* Do. six do.



5. *Edua Cheer.* Cut into more than six longitudinal splits.
6. *Podichoor.* Cut into finer bits.
7. *Mudichoor.* Cut into finest possible bits (not generally made but to order).
8. *Ottavettu* Cut into cross wise once. If the nuts are long, the central bit is taken out and only the two ends are left.
9. *Kuttnpude.* Central bits of the long nuts.
10. *Alaku.* Is No. 9 treated twice with "*Kali*" (Syrup or the boiled decoction).
11. *Krassl.* Thinnest boiled nuts — one nut cut across into 80 slices.

**South Kanara.** The nuts are allowed to ripen fully on the tree. When fully mature and yellow, they are dried contionously in the sun till the nuts rattle inside the shell. They are then shelled and marketed as such without any definite grading.

**Diseases and pests.** "*Koleroga*" or "*Mahali*" caused by *Phytophthora Parasitica* — var. *arecae* — is the important one. It is found to cause considerable damage in heavy rainfall tracts as in bad attacks the whole crop is seen to shed in the tender stages. *Control:* In North Kanara "*Kotte*" tying by means of small cover made of areca leafsheath or hillgrass dipped in Bordeaux mixture is being adopted to protect the bunches from rain and thus prevent attack of the fungus. It is not found as effective as spraying with Bordeaux mixture. It is practically controlled by adopting sanitary measures by destroying all the affected parts and then spraying with 1% Bordeaux mixture once just before the South West Monsoon and again after 1½ to 2 months. A third spraying may be necessary if the rainfall is very heavy. Large areas are now being protected in South Kanara and Mysore by these regular sprayings. The arecanut gardens in Mettupalayam and some parts of Malabar are free from this disease,

2. "*Anaberoga*" caused by *Ganoderma lucidus*. This is found in Mysore but is not serious (5) It is a wilt which infects the roots, proceeds up to the stem and causes wilting. Brackets develop on the side after the trees die. The tree should be cut off. Incorporating sulphur round the surrounding trees at half a pound per tree is also advised. In order to avoid-soil borne infection brackets should not be allowed to develop on the dead tree.



3. The stem-bleeding disease is caused by *Thielaviopsis* or *Ceratostomella*) *Paradoxa*. The removal and burning of the affected part is advised. Shading from South West aspect of the sun may be advantageous.

4. Band disease is found in Bombay. Nothing is done to control this at present. It appears to be physiological.

5. A new root disease is being seen in parts of the Travancore and Cochin. It is found to be highly contagious and work on its control is yet to be done. Attention to cultural operation coupled with manuring and liming are said to be desirable.

**Cost of Cultivation.** The following gives a rough idea of the cost of cultivation of arecanut in South Kanara District in 1946:—

Particulars.	Malnad area.	Non-Malnad area.
	Rs.	Rs.
1. Cost of raising & upkeep of the areca plantation up to 5 years till the crop comes to flower.	1,030—0—0	880—0—0
2. Amount realised by sale proceeds of catch crops during the period	600—0—0	750—0—0
3. Net cost per acre for 5 years	430—0—0	130—0—0
4. Cost of land per acre	1,000—0—0	2,000—0—0
5. Total cost per acre	1,430—0—0	2,130—0—0
From the fifth to the eighth year, the cost of cultivation will be met by the produce.		
6. Cost of the upkeep of the garden per year after the 8th year ...	360—0—0	288—0—0
7. Interest on capital	85—0—0	127—0—0
Total cost ...	445—0—0	415—0—0
8. Estimated value of yield at $2\frac{1}{2}$ candies in Malnad area and 3 candies in Non-Malnad area at Rs. 400/- per candy of 560 lbs.	1,000—0—0	1,200—0—0
Net profit per acre	555—0—0	785—0—0



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The price of nut at present is Rs. 520/- per candy and the net income therefore is much more. Further, an income of Rs. 100/- per acre is expected from other crops like banana, pepper, Jack etc., from the garden. The cost of cultivation varies with the localities and the nature of land.

**Summary.** The origin of the areca palm is not an agreed point. It is taken to be Malaya and the Philippine group of island.

2. The value of production of arecanut is more than  $5\frac{1}{2}$  crores of rupees in the Madras Presidency alone and thus it is an important commercial crop of South India.

3. The description of the plant and floral parts is recorded. It is a crop which is cross-pollinated and thus a number of different types is found mixed in the same locality. The main types are indicated.

4. An idea of the cultivation of the palm is given.

5. The curing methods and the names and grades of different cured products are found to vary widely. A brief description is given.

6. Different diseases on the palm are noted with their control measures. "*Mahali*" at present is found to be the most destructive.

7. The inter-crops grown are noted and the benefit or otherwise of the same is yet to be worked out.

8. A rough idea of the cost of cultivation and the net profits per acre is given.

9. The importance of taking up the improvements of the crop immediately is brought out.

**Conclusion.** As there is not much precise data available on arecanut, this paper has been mostly compiled from figures and observations collected from various sources and through personal enquiries.

Betel nut industry is of considerable capable extension and it is estimated that 80% of the people of India are consumers of betel nuts. We are spending a large amount on the import of this product from outside. It is possible to increase both the area and the production of the existing gardens by careful scientific improvements and it is, therefore, necessary and urgent that this question is taken up immediately.



The following are the most important points to be considered in the improvement of the arecanut.

1. Selection of seed nuts: As already shown under the description of the palm, this being a cross pollinated crop, pure types are not found in any of the existing gardens. It is, therefore, necessary to evolve a definite programme of breeding work to select and breed the best and the promising types.
2. Till pure strains are evolved through breeding, a beginning has to be made to select the best gardens and mark out individual groups of trees for the purpose of distribution of seedlings of known merit.
3. There is no definite data available on the proper cultivation, manuring etc., of the crop. It is, therefore, necessary to record in detail the local practices and thus evolve a standard method till research on this point is carried out.
4. Regular and definite control measures against diseases should be done to control and eradicate diseases.
5. The best intercrops to be grown, the period up to which they are economic and beneficial, should be found out by investigation.
6. It is seen at present that rows of trees facing the southern sun are generally affected and sun-burnt, the stems of these trees becoming burnt and hollow on one side. Investigations should be directed towards finding out the best shade trees (no tree is found to grow as quickly as *Areca catechu* except perhaps *Casuarina*, which requires a sandy light soil) or whether a thick belt planting of areca itself on the southern side will protect the garden from sun-burn.
7. The curing of the nut is an important aspect where standard methods are yet to be evolved. More careful preparation of the product to suit the markets would still further enhance the market prices. Small machinery to dehusk the nuts will have to be devised.
8. Grading and marketing of the product should be improved and regularised. It is seen at present that a large margin of the profits is taken away by the middlemen and it is time that regulated markets are established for the sale of arecanuts.



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