

Varieties and Forms of the Coconut

(*Cocos nucifera* Linn.)*

By

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The Country of Origin: The coconut belongs to the family of palms viz., *Palmaceae*. It is a very useful tree cultivated by man from very ancient times. De Candolle and others consider the Indian Archipelago to be the original home of the coconut. It is a unique species in respect of the characters of the stem and the nut and is very much unlike any other known species of *Cocos*. The coconut stands in a class by itself. There are some thirty species of *Cocos* and all these are wild in native America, though some of them have been brought under cultivation for ornamental purposes. If all the known species of *Cocos* have an American origin, it is difficult to explain how the coconut alone originated in the Indian Archipelago; and some (Bailey 1937) believe that America is the home of the coconut. By some others, the millions of years old fossil coconut of New-Zealand which is of the size of an arecanut is considered to be the progenitor of the present-day coconut. The consensus of opinion, however, regarding the origin is that the Indian Archipelago should be the original home of the coconut.

Variations in Characters: The generic name *Cocos* is derived from a Portuguese word for a monkey. The eye end of a coconut when the husk is removed, resembles the face of a monkey; and the specific name *nucifera* refers to the kernel bearing nature of the nut. The palm has been in cultivation for several centuries under varying conditions of soil and climate, up to 20° to 23° of latitude on either side of the equator and from the sea level up to an altitude of about 3,000 feet. Therefore, naturally considerable variations in the characters of the species occur. The stem may be thin or robust and its length may vary from just a few feet to 100 feet or more. Even in grown-up palms the length of the leaf and the petiole varies. A fully opened leaf may be 10-17 feet long depending on the nature of the soil and the age of the palm. The flower bunch (inflorescence) may be branched (a spadix) or rarely unbranched. The number of male and female flowers varies considerably, the former from 150-14,000 and the latter from 25-600 in a single inflorescence. The method of pollination may

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be cross or self. The time taken from pollination till the nut is ripe is 9 to 12 months. The shape of the nut ranges from linear to spheroid. The weight of copra or dried kernel which is the most important coconut product of commerce ranges from about an ounce to about 12 ounces. The percentage of oil (on moisture-free basis) in the copra varies from 65 to 75 (by chemical extraction). The life of the palm extends from 35 to 100 years. The range of colour variations also is considerable. The leaves and nuts may be green, yellow or rarely red or shades of brown. From the foregoing it is evident that the coconut is a variable species and one would expect a large number of varieties occurring in different coconut countries of the world. But considering the antiquity and the cosmopolitan nature of the species, the number of the so-called varieties of the coconut is rather limited. From a reference to the literature on the subject, it appears that the total number of the varieties in all the coconut countries is estimated not to exceed some thirty. Even this number may be reduced considerably if all the varieties were studied in the field in one place and the over-lapping ones are eliminated. Abnormalities and freaks sometimes called varieties are not to be included among the varieties proper.

Review of Literature: A few publications from important coconut countries are reviewed here:

Watt. (1889) mentions seven varieties of the coconut. He also states that "a small form is met with in East Africa that does not possess the fibrous pericarp". It is not clear what variety is meant. Perhaps he speaks of a dwarf with very thin husk. If so, such forms are well known in India. Regarding this, the remaining six may be grouped into three distinct varieties viz., (1) the dwarfs, (2) the ordinary tall and (3) the one bearing small nuts of the size of a turkey's egg. The fourth one "with heart-shaped fruit, pale-yellow colour, with an edible inner rind which turns red when the outer skin is removed" is probably the one with sweet husk mentioned by various authors. The remaining two are distinguished by their colour and shape of the nut can only be normal variants of the ordinary variety commonly grown in India. Hooker (1894) mentions of *C. nucifera* Linn. as the most commonly cultivated species and *C. nana* Griff. as a small low variety grown in the five islands and Ceylon. Trimen (1898) speaks of *C. nana* Griff. as "a very small-fruited dwarf" and gives it the name of Maldiva coconut. Here this dwarf variety appears to have been given the status of a species. It will be seen later that this is only a variety. He also speaks of a variety by name 'Tembili' with pink endosperm and called the king coconut. The name 'Tembili' is mentioned by Watt also but the colour of the endosperm which is unique in Trimen's 'Tembili' is not mentioned by Watt. The name 'King coconut' is given to the dwarf variety by other authors.

Ahmed Bin Haji Omar (1919) writes of the races of the coconut palm. He says that in the Singapore island there are twelve races differing in the characters of the nut and two in growth also. He mentions four races viz., Klapa Jatong, K. Bulat, K. Besar and K. Sepang from which copra is made in Singapore. K. Laga has too small a nut to be used in making copra. Two dwarf races viz., K. Puyoh (green) and K. Gading (yellow) are also included. K. Nipah is a promising high yielder but is not common. The shell of

K. Sekol is used for making cups. K. Wangi is said to have a 'peculiarly fragrant' endosperm and is medicinal. This unique coconut is also mentioned by Burkill (1935). He (Omar) has not described the races but has given photographs of the different nuts. The name Klapa or Kelpa meaning coconut is perhaps allied to Kalpa in Kalpa Vriksha (Paradise tree) a Sanskrit name for the coconut palm.

A Useful Dwarf Coconut: Handover (1919), and Jack and Sands (1922) have described a Dwarf Coconut called Nyiur Gading. It is a distinct small variety common in the Malay States, supposed to have been originally introduced from the Dutch Indies. Perhaps this variety first occurred as a mutant in Java. It is a small, hardy palm which begins to bear in about three years after planting. Bearing is profuse and the yield is said to be about 120 nuts per tree, per year. The thickness of kernel is good and the quality of copra is satisfactory. About 8400 nuts yield a ton of copra. The kernel is rich in oil and sweeter than that of the ordinary variety. Trees thirty years old, occurring in various parts of Malaya are said to be bearing profusely. Colour variants with yellow, golden, ivory yellow, green, brick red, green bronze and intermediate colours occur in the variety. The chances for self-pollination are more in this variety than in the ordinary one; 70-80 % or more of the progenies may breed true to type. This is the only dwarf grown on a plantation scale.

This useful variety may not be confused with other dwarf races or forms which go by different names—King coconut, Nicobar Dwarf, Laccadive Dwarf, Andaman Dwarf, Malay Dwarf, Chowghat (Malabar) Dwarf and Pathunettam-patta. These will be considered later. In fact, Nyiur Gading comes under the group of palms called semi-talls or medium dwarfs which are more hardy and robust than the true dwarfs, and have copra of good quality. The nut matures in about 11 months after pollination. The time of first bearing occurs in about four years after planting. The Tall X Dwarf or the Hybrid coconut evolved by the Department of Agriculture Madras, and the Ganga-bondam of the Circars (S. India) belong to this group of coconut palms.

Philippine Forms: Copeland (1931) in his book on the coconut has dealt with fourteen varieties occurring in the Philippines and the adjoining islands. Of these, five including Nyiur Gading already mentioned, are more important than the rest which include minor forms and freaks or abnormalities.

1. **The San Ramon:** This is a very high-yielding form with large nuts nearly twice as large as the ordinary, 3270 nuts giving a ton of copra. The yield is at times, said to be even 200 nuts per year. The distribution of the form ranges from Ceylon across Malaya and Polynesia. This is perhaps the largest nut found on a plantation scale. The large-sized nuts from Ceylon and the Kappadan of Malabar are allied to this form. From the account given the form is a very promising one for large-scale planting.

2. **The Lagana:** This is the ordinary tall variety, the most common and popular one typical of all the coconut countries of the world. About 6000 nuts are required to produce a ton of copra.

3. **The Coco-nino or the baby coconut:** This is a distinct, dwarf form with short trunk bearing in about four years after planting. It is a prolific bearer with rather thick and hard copra. About 100 nuts are produced by a single tree in a year. Some 7000 or more nuts are required to make a ton of copra. The form is specially valued for tapping and this is a promising one.

4. **The Pugai:** This is a very dwarf form fruiting in three years after planting. The husked nut is about 7 cms. in diameter and the husk is 2 cms. thick. The nut is so small that it does not seem to be economical for large-scale planting.

These four varieties fall into two main groups viz., the Tall and the Dwarf. Besides the varieties described in the foregoing, Copeland mentions others viz., Makapuno, the Thyru Thengai (curd coconut) of Malabar which has the cavity filled with a firm tissue and is considered a delicacy. This is occasionally found in coconut plantations. The nut does not germinate when planted and produce a seedling. The Makapuno is an abnormality. Certain trees produce both the normal and the abnormal nuts. The normal ones from such trees when planted produce trees giving Makapuno nuts also. Lono nuts with soft kernel and Taban with sweet husk are also mentioned. Taban is known to occur in the Malabar coast also where it is called Kaiththali. There are other types also specially used for decorative purposes, or for their very thick or very thin shell or husk. The one called Lincoranag has a characteristic low habit of growth. Among the colour types the one called Agta is unique in having a dark green colour almost looking black.

Variety spicata: Jacob (1941) described a very distinct botanical variety called variety *spicata*. This is sometimes known as the spikeless coconut because the inflorescence is unbranched and is without the usual flower-bearing spikes. For the same reason it is called the Panamaram Thengai in Tamil, meaning the Palmyrah coconut. This variety is unique in that it is the only one in which femaleness is most expressed and maleness least expressed, because the number of male flowers is as low as 50, while in the ordinary coconut the number of female flowers is very much less than that of the male flowers viz., 25 and 600 (average) respectively. The setting percentage i.e., the number of nuts produced per 100 female flowers is very low. The mature nut is smaller than in the ordinary variety; otherwise the characters of the nut are the same. At the Coconut Research Station, Kasaragod (S. India), it was found that 50% of the progenies (natural) of variety *spicata* bred true to the mother. This variety was also found to cross freely with other coconut varieties. The resulting hybrids were vigorous. Variety *spicata* can be made use of in coconut breeding, but is useless for tapping.

The Male Coconut: Var. *spicata* is one extreme of sex expression. It is almost a pure female except for a few male flowers. On the other hand, there is a tree at Kasaragod which is completely a male. It looks very much like any other ordinary coconut tree but is more robust, especially the inflorescence. But it contains all male flowers only, some 5000 per bunch, and is never known to have produced any female flowers or nuts. Similar male coconut trees are said to be found in parts of Malabar. The separation of sexes in different individuals is no doubt a sign of advancement in evolution. But from an economic point of view a male coconut tree is not only unnecessary but undesirable, because it is a loss to the planter. This rare find was described by John and Narayana (1942).

The Hybrid Coconut: John and Venkatanarayana (1943) described the hybrid coconut. It is also called the Tall \times Dwarf cross because it is obtained by crossing the ordinary tall variety with the pollen from the dwarf. The study of the hybrids on a field scale has been in progress during the last fifteen years at the Coconut Research Station, Nileshwar (Malabar Coast). The progenies are vigorous, with a short trunk and low habit. They

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are early and prolific bearers; they first flower in four years after planting and the nuts mature eleven months later. Their performance has been satisfactory. The yield of nuts is high and the quality and quantity of copra are fairly good. A few seedlings obtained from the hybrids were planted in the field and it remains to be seen how they will do when they begin to yield. Even if the hybrid does not produce palms similar to itself, it is not a serious drawback, because it lives for a sufficiently long period, and seed nuts to raise new hybrids have to be produced by artificial crossing. A number of inter-varietal, cyclic crosses between world varieties and forms are in the field. They are still too young to bear and it is too early to judge them. Still it may be said that hybridisation has opened a new line in the improvement of the coconut by producing new strains.

Freaks and Abnormalities: A dozen instances of abnormalities are mentioned by Patel (1938), and others in earlier years. These abnormalities are popularly, though incorrectly called varieties. They are, however, dealt with briefly in the following:

Poly-embryony: This is the phenomenon of a single coconut producing more than one seedling. The number may be two to four. More seedlings are produced on account of more embryos in the nut.

Branching Coconut: The ordinary coconut palm has only one growing point which gives rise to a single unbranched trunk. Various authors have recorded instances of coconut trees with a number of branches.

Foliation of the Spadix: This is an instance in which the flower bunch, instead of producing flowers and nuts developed small branches which have subsequently dropped off.

Vivipary: Here the young female flowers instead of developing into normal nuts grow into bulbils or small seedlings, which however, when planted in the ground failed to establish themselves.

Suckering Coconut: This is a rare instance of a coconut tree producing suckers like a plantain. The tree is at Kasaragod (South India). A picture of the tree is given by Patel (1938) in his Monograph on the coconut. When separated from the mother and planted in the field the sucker gave rise to quite a normal tree.

Horned Coconut: At times one or two flat horns of varying sizes are found developing from the base of the nut. These are modifications of the staminode of the female flower.

Also instance of the pistillode of the male flower developing banana like structures have been recorded. Certain coconuts with semi-solid kernel, and others with sweet husk are already mentioned in the previous pages.

The freaks though interesting by themselves are not of any economic use; and most of them occur in all the important coconut growing countries.

Classification of Varieties: The occurrence of different varieties and races in the various coconut growing countries of the world is well known. Most of them have been dealt with by authors as already mentioned. But a systematic classification of the known varieties does not seem to have been attempted. This is perhaps due to the fact, that the material to be handled is very difficult. Though certain varieties appear to be quite distinct, when considered by themselves, it is possible to connect up most of them except var. *spicata*, by a graded series of intermediate forms. This would naturally lead to considerable difficulty in defining the boundaries of any variety. Still it is necessary to separate the varieties as far as possible into definite groups and place them in their proper position. If not, the knowledge of the subject will tend to be confused. An attempt, therefore, is made in this paper to classify and name the outstanding varieties and forms.

The coconut is an important crop in South India and it has been studied by the Department of Agriculture, Madras, in its various aspects, during the last 33 years. The Department has maintained four Coconut Research Stations in the Malabar Coast, at Kasaragod, Nileshwar and Pilicode. With a view to studying the important world varieties, planting material was obtained in 1921 and 1924 from all the chief coconut-growing countries viz., Malay, Philippines, Java, Siam, Cochin-China, Ceylon and Laccadives, and planted it at the Coconut Research Station, Pilicode. The various economic characters of the varieties have been studied and the different forms are included in this paper.

The name variety is often used by many in the popular sense to include any variant whether it is a botanical variety, form or type. In the following account variety will be used only for botanical varieties, and races or forms and types will be denoted as such. From a study of the available material and perusal of the literature on the subject all varieties and forms can be broadly divided into two main groups viz., the tall and the dwarf. In each group there are number of forms. Eco-types of a form, such as heavy yielders and poor bearers are of local importance only and may not have much classificatory value.

The cosmopolitan species *Cocos nucifera* Linn., is divided into five varieties viz., var. *spicata* K. C. Jacob; var. *typica* Nar.; var. *nana* (Griff) Nar.; var. *javanica* Nar.; and var. *androgena* Nar. All these varieties cross with each other freely. Var. *spicata*

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was already considered. Var. *typica* is the ordinary, tall variety, found in all the coconut countries of the world, and includes most forms some of which are named here as: *ramona*, *Kappadan*, *malayensis*, *siamea*, *cochin-chinensis*, *nova-guineana*, *gigantea*, *pusilla*, and *laccadive*. The large nuts from Ceylon and *Kappadan* from Malabar are allied to forma *ramona*, but the yield of nuts of these forms is less than that of *ramona* in the Philippines. Var. *nana* is the dwarf variety and 'nana' is the earliest known name given to it. This includes all the pure dwarfs, and the forma *nana* (Coco-nino or baby coconut) and forma *maldiviana* (the Pugai of the Philippines). The first form has larger and economically more useful nuts, while the second has smaller ones. The Laccadive or Maldiv Dwarf, the Andaman Dwarf, the Chowghat Dwarf, the Chennangi and the King coconuts etc., come under forma *maldiviana*.

Var. *javanica* is Nyiur Gading said to be originally a mutant from Java. It is intermediate between the tall and the dwarf varieties and is breeding true; economically it is important. As it is considered to be a mutant a separate varietal status is given to it. The Gangabondam and the hybrid coconut of Madras belong to this variety. A tall type of coconut recorded as 'Java' at the Coconut Research Station, Pilicode may not be confused with var. *javanica*.

Var. *androgena* is the male coconut palm. A purely male tree is a unique occurrence and it is here given a different varietal name.

Descriptions of Varieties and Forms: Var. *typica*. This is otherwise called the ordinary or the common Tall variety and is most extensively grown on a plantation scale in all the coconut tracts of India and elsewhere. Though the coconut is not said to be a native of India by botanists, the ordinary variety has been in cultivation in India from very ancient times and may therefore be considered for all practical purposes to be the indigenous variety.

It is a long-lived, hardy palm thriving under different soils, climate and rainfall, and is found in littoral sands as well as in table-lands up to an altitude of about 3,000 ft. above sea level. It begins to bear in about eight to ten years after planting. Given sufficient soil moisture and plant food it grows well and lives to an age of about 80—90 years, and is fairly resistant to diseases and pests.

The stem of the palm, or trunk is smooth and erect and of medium girth of about 2 to 2½ ft. under rainfed conditions becoming stouter and more robust in irrigated and rich soils. The trees attain a height of about 50 to 60 feet or more. Every leaf axil of the bearing tree contains a spathe enclosing a spadix or branched spike. Female flowers which are only few are at the base of the spike and the numerous male flowers studded all over, occupy the rest of the spike. These open first and are shed in a period of nearly three weeks. Then the female flowers open and become receptive. Therefore the common occurrence in South India is that they are ordinarily cross-pollinated in nature, except in the summer months when there are chances for self pollination due to overlapping of spadices. After pollination, the nut matures in a period of twelve months, when it is fit for planting. Tender nuts are best obtained when they are about 5½ months old after pollination. The nut is medium sized varying in shape from spheroid to linear with colours varying from green, yellow and orange to shades of brown. The quantity and quality of copra are satisfactory. About 6,000 nuts yield a ton of copra.

There are many eco-types in this variety as heavy bearers, medium bearers, low yielders etc. The heavy bearers yield about 100 nuts per tree, per year under rainfed conditions. Early yielding, medium and heavy bearers are considered good for seed purposes. Alternate and irregular bearers are also met with in the variety; they give bumper crops in some years only, and are not selected for seed purposes.

The main forms of the var. *typica* are described in the following:—

1. Forma *ramona*: This form with large nuts and high copra content is described under the Review of Literature.
2. Forma *Kappadan*: The form is called Kappadan with reference to the large quantity of water contained in the tender-nut, (Kappadan = 16 bottles by volume). It is a form allied to the var. *typica* proper but is more robust in all characters, particularly in the size of the nut which is one of the largest on record. The shape of the nuts is broadly ellipsoid. The yield is rather low. Quantity of copra is high and copra is thick and hard.

This form is closely related to forma *ramona* and appears to have been naturalised in the West Coast and is met with in parts of South Malabar. The large nuts from Ceylon are similar to this form.

3. *Forma gigantea*: This is a form from the Andaman islands. As the name indicates, the form consists of palms with tall stature, massive proportions and majestic appearance. The nuts are round, green, and large, perhaps the largest on record. But the yield is poor, with only three or four nuts in a bunch. Though the copra content is high, the copra is thin and of poor quality. Water in the tendernut is plentiful and insipid in taste. The spathe did not yield to tapping and gave practically no juice.

First flowering occurs in about eight years after planting. It is not an economically important variety. The palms are resistant to diseases. The seed nuts give poor germination. A closely related type of this form, by name Andaman Ordinary is available at the Coconut Research Station, Pilicode. It is a good yielder of toddy. Nuts are big and similar in shape and appearance to those of *forma gigantea*. Stature is smaller than that of *gigantea*.

4. *Forma nova-guineana*: This is one of the forms of large sized palms. The palm is robust with a tall, stout trunk and a massive crown with large number of long leaves and bunches. The female flower production is high and setting percentage is rather low. The yield of nuts is fairly good being about 75 nuts per tree, per year. The nuts are medium-large, spheroid or ellipsoid in shape and green or orange brown in colour. The water in the tendernut is plentiful and sweet. Copra is thin and rather poor in quality. Percentage of oil in copra is low, being 66.2.

This palm comes to bearing in about seven years after planting. The form is unique in producing leaves and bunches in very quick succession. Sometimes two inflorescences open even on the same day especially in the summer months, while in var. *typica* proper the interval between the opening of successive bunches or inflorescences is about 25-30 days. This character contributes to high yield and is useful to the breeder. In its native habitat the form is said to produce one of the largest-sized nuts.

This form is susceptible to the attack of fungoid diseases, and pests.

5. *Forma cochin-chinensis*: The palm is robust with rather stout, tall trunk and large round crown well filled with large number of leaves and bunches. The bunches are large, full of fairly large-sized, spheroid nuts. The colour varies from green to shades

of brown. Female flower production is rather low but setting percentage is high. Tendernut has fairly large quantity of sweet water. The yield is high but the meat is thin; quality of copra is fair.

The palm comes to bearing in about eight years after planting. It is a useful variety possessing the desirable characters of high yield, medium-large size of nut and high setting percentage. The palms of this form are susceptible to the attack of fungoid diseases, and pests.

6. *Forma malayensis*: The palms of this form have a tall habit and the trunk is rather stout. The yield of nuts is low and the nuts are medium to large in size, green, and quite round or spheroid in shape. The water in the tendernut is sweet and plentiful with peculiar aroma about it. Copra content of nut is high and the quality is fairly good. The percentage of oil in copra is rather low. Female flower production is low and the setting is fair. The base of the button has a rose-ring seen clearly when the perianth is removed.

It is a late-yielding variety coming to bearing in about ten years after planting. It is highly susceptible to diseases and pests and there is fairly high shedding of buttons and tender nuts, but the form is good for tender nuts.

7. *Forma siamea*: This is an economically important form from Siam allied to *forma ramona*. The trunk is rather short and fairly robust with a good compact crown. The yield is medium, and the nuts are green, rather large-sized and ellipsoid or spheroid in shape. The water in tendernut is sweet and plentiful. The quality and quantity of copra are fairly good and the copra contains as much as 74.0% of oil. Female flower production is rather low and the setting percentage is moderately good.

The form is a late bearer beginning to yield in about ten years after planting. It possesses the desirable characters viz., good quality and quantity of copra and high percentage of oil, and is a useful form.

8. *Forma laccadive*: This form very much resembles the ordinary tall variety viz., var. *typica*, Female flower production and setting percentage are high. The nuts are medium sized, the quality and quantity of copra are good. Tendernut water is

satisfactory. The yield is high being above 100 nuts per tree, per year. It is a regular and heavy yielder of nuts. It gave the highest yield of toddy—twice as much as var. *typica*.

Economically it is a promising form on account of its high yield and good quality and quantity of copra. It will be worth while multiplying this form on a large scale in India.

9. *Forma pusilla*: This form resembles var. *typica* but is characterised by small-sized nuts and large bunches containing as many as 100 nuts or more in a bunch. The annual yield at times may be as high as 400 nuts per tree. Water or milk in the tendernut is very little and fairly sweet. The quality of copra is good though the quantity per nut is low on account of the small size of the nut. But the number makes up for the size. The form is unique for high female flower production and high setting percentage and yield—three important economic characters. Also the percentage of oil in the copra is very high, being 75%.

The shape of the nut is linear or spheroid according to the type. Spheroid nuts (unhusked) are at times very small being only of the size of a large orange. Then the number of nuts per bunch goes up to even 200. But the only drawback with the form is that it does not seem to be a regular bearer i. e. heavy yields are not regularly obtained every year. Still the average annual yield is high and the total nut-put of copra per tree, per year is more than in var. *typica* or the ordinary variety.

It is an important, economic form useful in crossing as well as for large-scale planting, and is particularly prized for making ball-copra. Popularly the form goes by the name of "Divi" which means island possibly referring to the Laccadive and other islands where it is largely grown and from where the copra of this form is exported. It is occasionally met with in the West Coast gardens.

The size of the nut being small the quantity of kernel utilized for the production of seedling is much less than in any other variety, which means a considerable saving of copra.

The following are the forms of the Dwarf variety viz., var. *nana*:

1. *Forma nana*: The Coco-nino or the baby coconut of the Malay States is described under the Review of Literature.

2. *Forma maldiviana*: This is a popular dwarf form. It has a short trunk and small stature, with small crown and short leaves. The trunk is thin, attaining a height of about 10 to 15 feet with age. Rarely trees are said to live for more than 35 years. Being rather delicate, the variety thrives best in rich soils and under proper conditions of drainage.

On account of its early bearing nature people have a fancy to plant it in back yards of houses and it is now fairly common all over South India, where it is naturalised. The trees come to bearing in about three years after planting and the bunches practically touch the ground in the early stages of bearing and are pretty to look at.

The nuts are small sized and yield a fairly good supply of sweet milk or water in the tendernut. But the copra is thin and of poor quality being leathery. It is therefore not met with on a plantation scale in India. It is also susceptible to the attack of pests and diseases.

Unlike in var. *typica* there are chances for self-pollination due to overlapping of male and female phases of flowering. The nuts mature in about ten months after pollination i. e., two months earlier than those of var. *typica*. Also the leaflets in the seedlings split much earlier than in the seedlings of the var. *typica*.

There are two types in this form. One type has very small narrow nuts with very small quantity of copra. The other has fairly large or medium sized nuts and these should be preferred for planting. Colour forms viz., green, yellow and orange or red and brown are common. These are ornamental. This variety when crossed with var. *typica* (mother) gives rise to progenies with hybrid vigour.

The various forms have been named after the country from which they were originally obtained or where they are largely grown, or after a distinguishing character of the form.

The data relating to the measurable characters of some of the varieties and the forms are furnished in the table appended, which will give a comparative idea of their economic characters. The relative sizes and shapes of the cut and the unhusked nuts are figured in two plates.

A separate key for the identification of the varieties and forms is also included.

Uses of the Varieties and Forms: The uses of the coconut are many and varied. Practically every part of the tree and the nut is put to some use or other. Most books on the coconut deal with the many purposes for which it is utilized. The most important commercial product is the copra or dried kernel. For a planter the main consideration is the production of the best quality of copra at a low cost. The output of copra per tree, per year contributes to the yield of plantations. This depends upon the number of nuts each tree bears in a year and the quantity of kernel contained in the nut. The large size of the nut alone does not count, because in the poor soils of South India, the yield of nuts goes down as the size increases. Based on these considerations the best variety for this country is the var. *typica* or the ordinary tall as also forma *laccadive*. The best planting material has to be rigorously selected from among promising eco-types. The *laccadive* form is in fact better than var. *typica*, but planting material is not available on any large scale. There are only a few trees at the Coconut Research Station, Pilicode and attempts have to be made to multiply the form on a large scale for distribution. The form called *pusilla* or Laccadive Small as it is called popularly, is quite good from the view point of copra production. But as the size of the nut is small, the husking and breaking charges to produce a unit weight of copra may be comparatively higher. It is a form specially suited to make ball copra which is much in demand in certain North Indian markets. The percentage of oil in this form is the highest on record in the Madras collections.

In this context, the famous San Ramon nut (forma *ramona*) is worth considering. It yields twice as much copra of good quality as the var. *typica* proper of India. The yield of nuts also per tree is quite high. If this form can do as well in India as it has done in Philippines it should be easily possible to double our output of copra per acre. But unfortunately, it does not seem to have been given any large-scale trial in this country. Also the Pilicode collections are lacking in this important form. The Nyiur Gading or forma *javanica* of the Malay states, which is an early bearing, heavy yielder appears to be promising on a plantation scale, but it has not yet been given a proper trial in India. It will be worth

while introducing these two forms and study their performance carefully in the different coconut tracts of the country, before contemplating large-scale planting.

From the view point of production of sweet toddy for jaggery (gur) making, the forma *laccadive*, the type Andaman Ordinary and the form *pusilla* are the best yielders. Among the dwarfs, forma *nana* is reported to be a high yielder of juice. For the coir fibre forma *laccadive* is good. For ornamental purposes the dwarf types are the best. They have a short stature and well-filled bunches of nuts with different colours as ivory, orange and apricot, almost touching the ground, and make pretty palms in any garden. Among the ordinary tall variety there are certain trees which produce undersized nuts with thicker shell than the normal and these can be used for carving and shell work.

The different varieties, and forms afford a wealth of material for the coconut breeder whose ideal is an early bearing, high yielding palm with large nuts having superior quality of copra and high percentage of oil. And high yield is the resultant of quick production of flower bunches with large number of female flowers with high setting percentage. The palms should also be resistant to pests and diseases. The breeder's ideal can not be achieved by selection alone, as the different economic characters are distributed among the various varieties and forms and recourse should be had to crossing. Fortunately all the varieties and forms cross freely with one another and they can be utilized to produce new and useful, economic strains.

Introduction of Varieties: Reading of the many varieties one may be naturally inclined to get outstanding varieties from foreign countries. In this respect particular caution should be exercised especially when large-scale planting is contemplated. Because all varieties are not cosmopolitan, which means that they will not do equally well in different countries, as the conditions of soil and climate vary considerably from country to country. Also, it should be remembered that in most varieties cross-pollination is the rule, and the progenies may not breed true to the parent (mother). The object of introducing a new variety should be clear—it may be for increase output of copra, or toddy for jaggery making or for ornamental purposes. It is important to ascertain, before importing foreign varieties, whether similar or nearly similar varieties are already available in the country. A variety which has done well in a foreign country need not do equally well in this country. The

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famous San Blas coconut of Panama which is very productive proved disappointing when it was introduced into the Malay States. Most of the imported varieties grown at the Coconut Research Station, Pilicode (Malabar Coast) did not come upto expectations. Many of them were highly susceptible to the attacks of pests and diseases, particularly shoot rot. The size of nut went down and the quality of copra was inferior in many instances. Such risks private planters cannot take and it is best to leave the introduction of foreign varieties to the Coconut Research Stations, which should be in a position to conduct proper trials, and advice the public regarding the best material and variety suitable for planting. Also while introducing new varieties the risk of introducing diseases into a healthy tract should be seriously considered and guarded against.

Summary: The paper deals with the varieties and the forms of the coconut. The information available on the different sorts grown and studied at the Coconut Research Station, Pilicode, and that gathered from publications dealing with the subject from various coconut growing countries is included. A systematic classification of the available material has not been attempted by previous authors, and it is done in this article. The species *Cocos nucifera* Linn. (the coconut) is divided into five varieties, of which only one has been hitherto described. All the varieties fall into two main groups viz., the Tall and the Dwarf. In the Tall groups, three varieties and nine forms and in the Dwarf two varieties and two forms are recognized; these now bear new names, which are mostly after the names of the countries from which they were obtained. The ordinary, tall variety which is typical and cosmopolitan in all the coconut growing countries is called var. *typica*. The many types of local importance found in various countries are not emphasized upon. Descriptions of the varieties and forms and a table of their quantitative characters are given, as also a key for their identification. The importance of outstanding forms like the Laccadive nut, and the famous San Ramon from the Philippines is brought out. The dwarf mutant, here named as var. *javanica* and spoken of as a good performer is recommended for trial. The rare find of a purely male coconut tree which shows the direction of evolution of the coconut species is christened as var. *androgena*. Varieties or forms for special purposes like commercial planting, or for tapping or for ornamental planting etc., are mentioned. The possibility of evolving new and economically useful strains by hybridization is indicated.

It is, however, not claimed by the authors that the work of study and classification of the many varieties and forms of the coconut is either complete or comprehensive, and much remains to be yet done on the subject.

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KEY FOR THE IDENTIFICATION OF COCONUT VARIETIES AND FORMS

Varieties

- A. Inflorescence unbranched or rarely with one or two small spikes ... var. *spicata*.
- A.A. Inflorescence normal and always branched
 - B. Tall, late bearing palms
 - C. With both male and female flowers ... var. *typica*.
 - C.C. With only male flowers ... var. *androgena*.
 - B.B. Dwarf and early bearing palms
 - D. Vigorous palms bearing in 4 years ... var. *javanica*.
 - D.D. Delicate palms bearing in 3 years ... var. *nana*.

Forms of var. *typica*.

- A. Nuts very small (about 1000 cc. in volume) and very many in a bunch—even 100 or more ... *pusilla* (Laccadive small)
- A.A. Nuts not small
 - B. Nuts very large (7000 c. c.), majestic palms, copra content low and quality inferior ... *gigantea* (Andaman giant).
 - B.B. Nuts medium large (about 6000 c. c. or less)
 - C. Nuts about 6000 c. c., copra superior and quantity high—about 10—12 oz. per nut
 - D. Yield of nuts per tree, per year, about 100 even ... *ramona*.
 - D.D. Yield of nuts low about 35 per tree, per year ... *Kappadan*.
 - C.C. Nuts 4000 c. c. in volume or less
 - E. Trunk robust—90—100 cms. in girth
 - F. Percentage of oil in copra high (74) ... *stamea*.
 - F.F. Percentage of oil in copra low (66—69)
 - G. Female flower production (annual) very high (744) ... *nova-guineana*.
 - G.G. Female flower production (annual) low (220) ... *malayensis*.
 - E.E. Trunk of medium girth (73—83 cms.)
 - H. Copra thin (0.82 cms.) and % of oil in copra low 66 ... *cochin-chinensis*.
 - H.H. Copra thicker (1.2—1.3 cms.) and percentage of oil high 72 ... *laceadive*.

TABLE
The quantitative characters of the coconut varieties and forms—Coconut Research Station, Pillicode

Serial Number	Variety or Form	Age of tree	Age at first flowering	Girth of trunk at base	Number of leaves in the crown	Length of leaves	Length of petiole	Mean production of female flowers per year	Highest yield of nuts recorded per tree in a year	Quantity of water in tender nut	Weight of unhusked nut	Weight of husked nut	Volume of unhusked nut	Volume of husked nut	Mean thickness of meat	Thickness of husk (Middle of husk)	Mean copra content per nut	Percentage of oil in copra (Ether extraction)	Yield of juice per day, per palm	Serial No.
		Year.	Year.	Cms.	Cms.	Cms.	Cms.	C.C.	Grams.	C.C.	Grams.	C.C.	Grams.	C.C.	Cms.	Cms.	Cms.	Grams.	C.C.	
1.	Var. <i>typica</i>	...	25	73	34	594	129	320	80	300	1134	454	2264	465	1'21	2'45	159	71'6	899	1
2.	Forma <i>laccadive</i>	...	16	76	39	533	137	648	160	290	1219	510	2170	500	1'25	3'04	157	72'2	1758	2
3.	" <i>pusilla</i>	...	16	91	30	526	144	522	400	261	709	225	1200	250	1'12	1'40	60	75'3	1234	3
4.	" <i>Kappadan</i>	...	...	...	...	...	...	...	35	894	1929	193	5750	1135	1'48	4'30	332	61'7	...	4
5.	" <i>stamea</i>	...	15	93	32	487	132	175	59	841	1899	737	3915	855	1'10	3'60	221	74'3	41	5
6.	" <i>gigantea</i>	...	16	114	38	579	152	199	35	500	1786	878	6900	800	1'29	6'30	180	67'1	Nil	6
7.	Type Andaman Ordinary	...	16	7	31	533	144	451	40	377	1701	552	3640	700	1'28	3'70	170	67'1	1339	7
8.	Forma <i>nova-guineana</i>	...	15	7	31	579	152	744	93	348	1105	368	3600	580	1'12	5'20	213	65'6	541	8
9.	" <i>malayensis</i>	...	15	10	29	465	114	220	44	609	1616	935	3200	996	1'22	2'40	200	69'0	680	9
10.	" <i>cochin-chinensis</i>	...	15	8	30	609	137	208	88	464	1162	652	2340	750	0'82	2'30	140	66'2	758	10
11.	" <i>maldiviana</i>	...	15	5	27	396	106	140	86	348	623	317	1053	450	0'96	1'55	84	66'2	310	11
12.	Var. <i>spicata</i>	...	8	78	30	513	134	978	25	210	510	283	1950	500	1'25	2'10	141	70'6	Nil	12

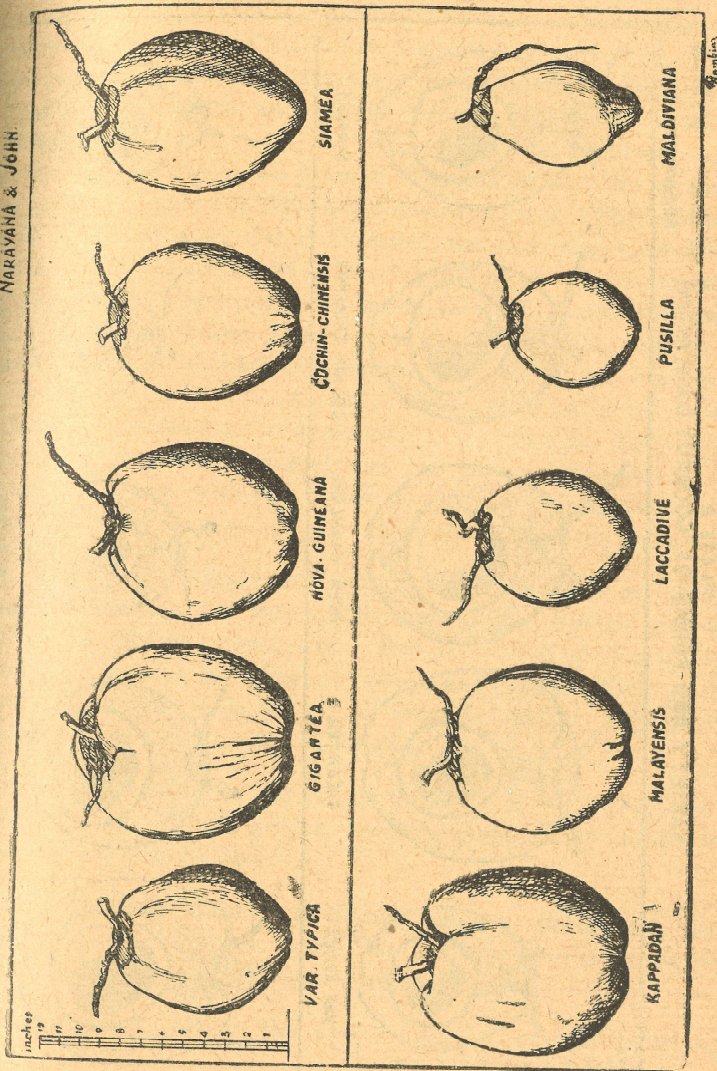
(Note: 1 oz. — 28·35 grams):

(1 Fluid ounce — 28·41 C. C.)

Varieties and Forms of the Coconut

PLATE 1 VARIETY AND FORMS OF COCONUT

NARAYANA & JOHN

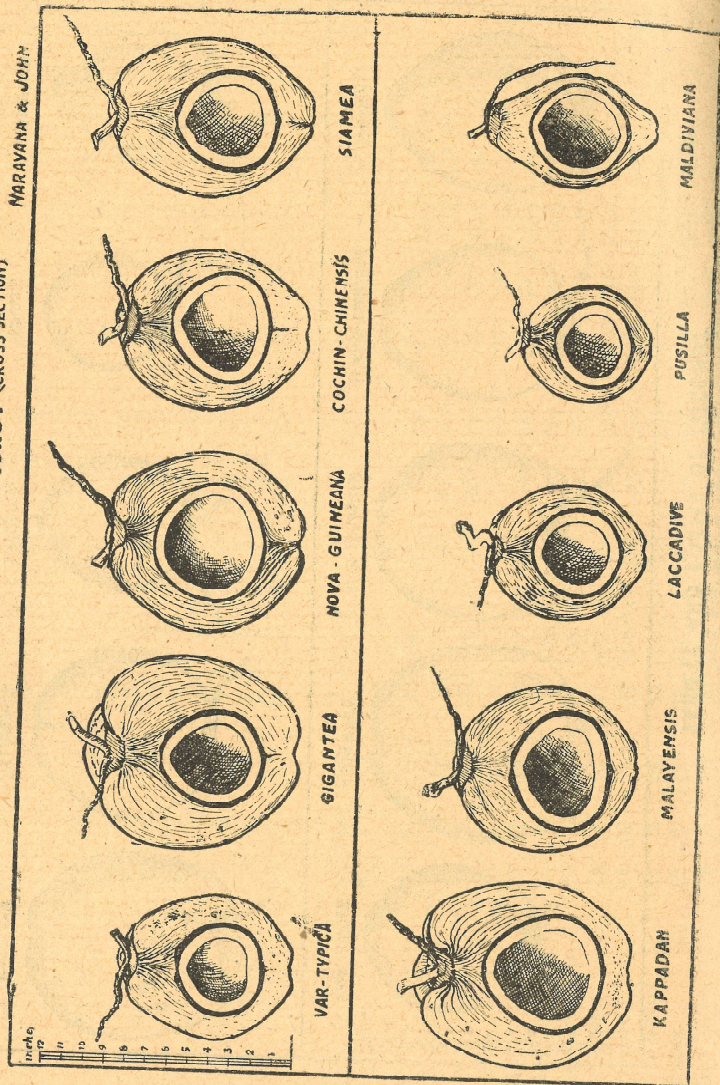


(Note: 1 oz. — 28.35 grams):

(1 Fluid ounce — 28.41 C. C.)

... 8 4 78 30 513 134 978 86 348 623 317 1053 450 0.96 1.55 84 66.2 310 11 70.6 680 9 758 10 310 11 70.6 680 9

PLATE 2
VARIETY AND FORMS OF COCONUT (CROSS SECTION)



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