

NOTES ★  
~~ON~~  
CARDAMOM CULTIVATION,  
BY  
**T. C. OWEN,**  
WITH  
AN ESTIMATE OF EXPENDITURE  
AND  
**RETURN FOR 25 ACRES**  
AND  
*NOTES ON THE ESTIMATE.*

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# NOTES ON CARDAMOM CULTIVATION.

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**I**N the following notes on cardamom cultivation I have endeavoured to condense into as concise and practical a form as possible what is known on the subject in Ceylon. There is much to be learnt still on several points, and it is quite probable that further knowledge will show statements here made to be incorrect or liable to modification ; but there are so many planters who are now turning their attention to the subject, that I have been tempted to compile these notes in the hope that they may be of benefit, and save them some of the trouble and loss inseparable from bought experience.

The cultivation of cardamoms has been very much extended in Ceylon during the last few years, and is likely to increase still more in the future : it is to be hoped, however, that this extension will not be excessive, as it will certainly result in a considerable amount of failure and loss, for cardamoms will not grow everywhere. The market is also one which can be easily over-stocked, when prices would no doubt fall considerably. In 1873 and 1874 we exported about 9,000 lb. each year ; in 1875, the export of cardamoms was equal to 14,337 lb. valued at R15,521 ; but in 1876 only 4,965 lb. and 32 packages, valued at R8,202 were sent away ; and in 1877 we exported 11 packages 11,108 lb., value R19,226 ; and in 1878 the export was 15,975 lb., value R35,398 ; and in 1879 we count 17,732 lb., valued at R15,127 ; the return for 1880 is 17,392 lb. exported ; for the calendar year 1881 the export was 17,769 lb ; for the season 1881-2, 23,127 lb.

Cardamoms are used as a spice and flavouring material for cakes and liqueurs, also in medicine.

The following extracts from " All about Cardamoms " by Messrs. A. M. & J. Ferguson, will be of interest as showing the method of cultivation followed in India :—

Previous to the commencement of the rains, the cultivators ascend the mountain sides, and seek in the shady evergreen forests a spot where some cardamom plants are growing. Here they make small clearings, in which the admission of light occasions the plants to develop in abundance. The cardamom plants attain 2 to 3 feet in height during the following monsoon, after which the ground is again cleared of weeds, protected with a fence, and left to itself for a year. About two years after the first clearing, the plants begin to flower, and five months later ripen some fruits, but a full crop is not got till at least a year after. The plants continue productive six or seven years. A garden, 484 square yards in area, four of which may be made in an acre of forest, will give, on an average, an annual crop of 12½ lb. of garbled carda-

moms. (a) Ludlow, an Assistant Conservator of Forest, reckons that not more than 28 lb. can be got from an acre of forest. From what he says, it further appears that the plants which come up on clearings of the Coorg forests are mainly *seedlings*, which make their appearance in the same *quasi-spontaneous* manner as certain plants in the clearings of a wood in Europe. He says they commence to bear in about 3½ years after their first appearance. (b) The plan of cultivation above described is that pursued in forests of Travancore, Coorg and Wynaad.

On the lower range of the Pulney Hills, near Dindigul, at an elevation of about 5,000 feet above the sea, the cardamom plant is cultivated in the shade. The natives burn down the underwood, and clear away the small trees of the dense moist forests called *sholas*, which are damp all the year round. The cardamoms are then sown, and when a few inches high, are planted out, either singly or in twos, under the shade of the large trees. They take five years before they bear fruit; "in October," remarks our informant, (c) "I saw the plants in full flower and also in fruit,—the latter not however ripe."

In North Canara and Western Mysore, the cardamom is cultivated in the betel-nut plantations. The plants, which are raised from seed, are planted between the palms, from which and from plantains, they derive a certain amount of shade. They are said to produce fruit in their third year.

Cardamoms begin to ripen in October, and the gathering continues during dry weather for two or three months. All the fruits on a scape do not become ripe at the same time, yet too generally the whole scape is gathered at once and dried,—to the manifest detriment of the drug. This is done partly to save the fruit from being eaten by snakes, frogs and squirrels, and partly to avoid the capsules splitting, which they do when quite mature. In some plantations, however, the cardamoms are gathered in a more reasonable fashion. As they are collected, the fruits are carried to the houses, laid out for a few days on mats, then stripped from their scapes, and the drying completed by a gentle fire-heat. In Coorg, the fruit is stripped from the scape before drying, and the drying is sometimes effected wholly by sun-heat.

Cardamoms vary in size, shape, colour and flavour: those which are shortly ovoid or nearly globular, and 4-10ths to 6-10ths of an inch in length, are termed in trade language *shorts*; while those of a more elongated form, pointed at each end, and 7-10ths to 9-10ths of an inch long, are called *short-longs*. They are further distinguished by the names of localities, as *Malabar*, *Madras* and *Aleppy*. The *Malabar Cardamoms*, which are the most esteemed, are of full colour, and occur of both forms, namely *shorts* and *short-longs*; they are brought to Europe *via* Bombay. The *Madras* are chiefly of elongated form (*short-longs*) and of a more pallid hue; they are shipped at Madras and Pondicherry. Those termed *Aleppy* are generally *shorts*, plump, beaked, and of a peculiar greenish tint; they are imported from Calicut, and sometimes from Aleppy.

Cardamoms are esteemed in proportion to their plumpness and heaviness, and the sound and mature condition of the seeds they contain. Good samples afford about three-fourths of their weight of seeds. (d)

The fruits of the second form (var. *β*) of *Elettaria Cardamomum*, known in trade as *Ceylon Cardamoms*, are from 1 to 2 inches in length, and 3-10ths to 4-10ths of an inch in breadth, distinctly three-sided, often arched, and

(a) Report on the Administration of Coorg for the year 1872-73, Bangalore, 1873-74.

(b) Elliott, *Experiences of a Planter in the Jungles of Mysore*, Lond., ii (1871), 201, 209.

(c) Colonel Beddome, *Conservator of Forests*, Madras.

(d) Thus 202 lb. shelled at various times during 10 years, afforded 154½ lb. of seeds. (Information from the laboratory account of Messrs. Allen and Hanburys, Plough Court, Lombard St.)

always of a dark greyish-brown. The seeds are larger and more numerous than those of the Malabar plant and somewhat different in colour and taste.

Some time in the month of February (say 1866) or March, the felling party, (say ten men) 5 provided with axes and 5 with large knives, under charge of some intelligent man, if a Coorg, called Yejamána, take the necessary supplies and start for the jungle. They begin by building near to some stream a temporary hut to shelter them at night. The next morning, the Yejamána, who is well acquainted with the jungle and has previously chosen the sites for the new garden, points out to the coolies the trees to be felled. Half the party commence to cut down the surrounding small trees and brush-wood, the others to fell the large trees.

Should any tree not fall heavily enough to shake the ground well, another tree is felled across it.

On an average, in one day the party of 10 will make 5 gardens. Care is taken to leave about 20 to 30 yards of jungle between each garden, as well as not to make too many gardens, in one year, lest there should be too great and sudden a decrease of moisture which would be injurious.

Generally from 50 to 100 gardens are made annually, until the whole jungle is under cultivation. If represented in a plan, a cardamom jungle would not be unlike a checkered board.

The young plants shoot up during the early rains of the monsoon on all sides of the clearing, but specially near to the roots and stem of the fallen tree. By October they will have grown 3 to 4 inches, and be one foot in height with 8 to 10 leaves by the ensuing February 1867.

By February, 1868, they will be two feet, and by February, 1869, 4 feet in height. In October, 1869, they will give a light crop called by the Coorgs "Dévakottu" (God's fruit.) (c)

At this time each rhizome will have thrown up about eight stems.

After the plants have grown to the height of two feet, the gardens must be annually weeded; at first but slightly. When they have reached the height of four feet, a little culling will be requisite. For each plant must have six feet of clear ground left around it. Care must be taken in selecting what plants shall remain, and what be removed as superfluous.

(f) In October, 1870, the plants will give a good crop, and will probably continue giving good crops until 1877, when they will begin to look sickly. It will then be necessary in February, 1878, to select some large trees (g) from the surrounding jungle, and fell them right across the sickly plot. Young plants will spring up, and many of the old plants will have their stems and racemes killed by the fall, but from their rhizomes fresh stems will shoot, and the plants will bear with increased vigour for 8 years, when the same process of renovation will have to be gone through again. The year in which the trees are felled across the sickly plots and the ensuing year, but light crops will be obtained. According to the quality of the soil, the gardens will come into bearing sooner or later, and if carefully worked, a cardamom jungle never becomes exhausted. One rhizome will often have over 20 stems. Every seven or eight years the old stems die, but are replaced by fresh ones.

The fruit is occasionally borne on the upper part of the stem, but this is very rare.

When from one stem four racemes are thrown out, it is called Nijaphala (true crop) or Páráphala (full crop); if 3 only, Mukkáphala  $\frac{1}{2}$  crop; if two,

(e) The first fruit of the plantain is similarly called Deva Gone, Gods' bunch.

(f) The crop in the Gadi Malés ripens about the 1st of September, and as showers at this time are prevalent much trouble is experienced in drying the crop. In the Umalés picking seldom commences before the first of October.

(g) This work is sometimes performed in the months of October and November.



Ardaphala, half crop; if one only, Káluphala  $\frac{1}{2}$  crop. One raceme will have from 8 to 14 branches, and each branch from 3 to 6 pedicles. When the crop is good, the branches are close together; when bad, the racemes are long, and the branches far apart. (h)

In the month of September or October, the cardamom gatherers start for the Malés. A well-thatched hut is constructed, for rain may be expected. On each side of the hut are their bunks, and in the centre a large pit is made, about 4 feet square, and 3 feet in depth, to contain 4 or 5 butties. (i) The sides are covered with leaves, and around the top, stones are put to prevent the dirt from falling in. This pit is to receive the cardamoms when picked off the racemes. It is necessary to send people to the jungle before the crop is ripe, to watch and guard against it being stolen. The crop is also gathered before fully ripe, otherwise it will be eaten up by snakes and frogs, and the capsules, if ripe, split, when undergoing the process of drying. The workmen are formed into two parties, one goes in front with large knives to clear the gardens of weeds and young trees, (the latter must be cut close to the ground) and the plants of dead stems.

After them come the gatherers, who break off the racemes close to the stems of the plant. There is a tree common in these jungles called the "Netti Mara," its leaves are very large; these intertwined form a basket called Kotakari, about 2½ feet long and 2 feet broad, like a small Goraga (j) in shape. Each gatherer has one of these, into it he puts the racemes he has collected. When they reach home with their loads they place them down near the pit, and after having refreshed themselves with a good substantial meal, commence to pick the capsules from the branches. This work often keeps them up late at night.

The next morning the cardamoms are measured, put into bags, and sent to the drying ground. On arrival, they are again measured by the Yejamàna in charge of the drying ground. Most people dry their cardamoms at their nád homes, but some jungles are so far away that the owners prefer drying the cardamoms on the spot. For drying a crop of eighty butties of cardamoms, about 8 men are required. Near to the drying ground there must always be some kind of shed or house into which the cardamoms can be removed should rain threaten. Cardamoms are dried by exposure to the rays of the sun. They are spread out thinly on large bamboo or date mats. Those nearly dry are never allowed to get mixed with those still green. Four days' strong sun is quite sufficient, and great care must be taken not to leave them too long in the sun, else the capsules will burst. Should rain come on, they have to be dried by the smoke of wood fires.

This turns them a dark colour, and lessens their value. Cardamoms dried in the sun become of a yellowish white colour. The Coorgs all endeavour to get the work finished before the 5th November, as their great Huttari (k) feast commences about that time.

I tied up a few racemes with branches and capsules attached in a room with a good draft of wind. The result was very satisfactory. The cardamoms took longer to dry than if they had been exposed to the sun, but there was no perceptible difference between them and the best sun-dried ones.

After they are dried the fruit stalks have to be removed.

Two men sit down on the ground opposite one another, and place their legs so as to form a kind of hollow between them, into which a small strong

(h) Racemes begin to shew in October and November, and are of a good length by the ensuing February.

(i) A Butty is a measure which contains 80 Seers or 40 Hanes.

(j) Goraga is a covering, worn during the monsoon, by coolies to keep off the rain, and formed so that it permits of their working freely under it. It is made of rushes interwoven.

(k) Huttari, from Pudi-ari, feast of the first fruits of the rice plant.

round bamboo basket slightly hollowed is fitted. This is called a "Yella Mankari" (l); into this another man feeds the capsules. The two men seated on the ground rub the capsules with their open hands against the basket, and by this process they are freed of their stalks. This work is very trying, and unless the coolies wear a veil over their faces, the dust, which is very pungent, makes them ill. Nor can it be performed in rainy weather, as the capsules absorb moisture very freely, and, if they were subjected to this process when damp, would be spoilt. After this women carefully separate the refuse and the empty capsules, called jallu, from the seeds (m) and capsules; and the seeds from the entire capsules, by hand winnowing.

The different qualities of capsules should also be separated from one another, by which the crop is rendered more valuable than when the good and bad remain mixed together. The thorough cleansing and preparing of the capsules is of the greatest importance to the cultivator. They are then put into baskets and kept in a dry room, to which the wind has but little access. This is done to preserve their aroma. Cardamoms lose in weight and shrivel in bulk by keeping, therefore the sooner they are disposed of, the greater will be the return (supposing there be no rise in price.) They are purchased by the cardamom sáhukars, who with their agents traverse the náds at this time of the year. They are sold per maund weight, the sáhukars taking delivery at the seller's house. The Coorg seer is  $R27\frac{1}{2}$  weight; there are 40 seers to the maund, and twenty maunds to the candy, which is equivalent to 550 lb. When speaking of cardamoms, if the word maund is used, the allusion is generally to dry cardamoms; if the word butty is made use of the reference is to green cardamoms.

Rain is essential to the cardamom plants. A heavy monsoon is good for them, but they derive particular benefit from the partial showers that fall in January, especially when followed by others in March or April. The old people say that in former years the rainfall was very much heavier. But in those days they were not so well off as now, and were often obliged to be out in all weathers, which may somewhat account for this statement on their part. However, there is no doubt that during the last 4 or 5 years, the country has been visited by unusual droughts.

There are three DESCRIPTIONS OF CARDAMOMS which are of interest to us in Ceylon,—the *indigenous Ceylon*, the *Malabar*, and the "*Mysore*." The *indigenous Cardamom* is said to be a variety of the same species as the *Malabar*; it is distinguished from the latter by the appearance of the leaf-sheaths and leaves, which are coarser in the former than in the latter. The leaves of the *Malabar* cardamom are silky on the under surface; in the indigenous variety this characteristic is less marked. The test of colour is, however, the most obvious means of distinguishing between these two varieties. The stem of the *Malabar* cardamom is invariably of a pale-green or whitish colour at the base; the indigenous cardamom, as far as my experience goes, is always distinguished by a pink tinge, deeply marked at the base of the stem, and more or less traceable the whole way up the leaf-stalk. The produce of the indigenous Ceylon cardamom, the "ensal" of the Sinhalese, is of very inferior value to that of the "rata ensal" or *Malabar* cardamom. The fruit of the former is very much longer than that of the latter, but this, the great distinction between the two, is of no value as a guide in

(l) Kanarese, Mankari; English-basket.

(m) Seeds are sold by weight. When freed of their pods they soon lose their aroma, and are consequently not so much valued as entire capsules.

choosing plants. In purchasing plants or bulbs from natives care must be exercised that none of the former are substituted for the more valuable kind. The Sinhalese cardamom is found growing wild in many parts of the island, especially in the Saffragam district. Malabar cardamoms are very largely grown by the natives in the Kandyan villages, but they do not appear to give the necessary time or attention, either from laziness or ignorance, to curing them for foreign markets.

The most robust variety is that known as the "*Mysore*," though what claim it has to this designation is not altogether apparent. It is suited for growth at a higher elevation than the Malabar, and it stands wind and exposure better. This cardamom is distinguished from the Malabar by much larger and coarser leaves, of a darker green, and which are hard and smooth on the under surface and not soft and velvety. The most remarkable feature is that the racemes, instead of spreading over the surface of the ground, are borne perpendicularly from the bulbs, and the fruit grows in clusters of five and seven. The value of the produce from this plant is certainly not less than that of the Malabar.

Fine rich loamy soil is absolutely essential for the successful growth of cardamoms, and this is usually found in the situations most favourable to their growth, sheltered, moist hollows. The plants will grow on ridges and in inferior soil, but their fruiting powers are but small, and their growth stunted. It is therefore unadvisable to plant large blocks with them, as a considerable proportion of the land cannot fail to be unsuitable. The most successful method is to devote the banks of streams, and damp hollows alone to cardamom cultivation, planting the ridges, and all exposed or poor land, with some hardier product. There has been some discussion as to the absolute necessity for shade, and it has been hoped by many that at high elevations it may be dispensed with, and thus much land otherwise unsuitable, be rendered available. Unfortunately however, a certain amount of shade appears to be essential. The plants will grow in the open, the hardier individuals rapidly, the weaker in a half-hearted fashion, but the plants do not bear properly; the racemes seldom extending more than an inch or two from the stem, within, in fact, the small amount of shade offered by the leaves of the plant itself. Perhaps it may be feasible to plant artificial shade with the cardamoms, which, if it consisted of rapid growing trees, would be efficient by the time the plants began to bear, and this system is well worthy of trial. Amongst thick coffee it is probable that cardamoms will answer well, but the kind of coffee amongst which they should be tried is such as proprietors do not generally care to supercede with other products. In India, Malabar cardamoms are found indigenous between 2,500 and 5,000 feet. The Ceylon variety are found mostly in the lowcountry. The former appear likely to be successful within a very considerable range in Ceylon, from a few hundred feet above sea-level up to 4,000 feet.

At the higher elevations, as is natural, they take longer to come into bearing, and seem very backward for the first year or two, but when they do come into bearing, fruit freely. The Mysore variety grow and fruit at a higher elevation than the Malabar, but the exact limit has yet to be determined. The Indian cardamom region is said to have a mean temperature of 72° F. (22°C.), and mean rainfall of 121 inches. They require a good and well distributed rainfall in Ceylon. Shelter from *wind* is a most essential condition, a very small amount of it will damage the plants irretrievably, the amount of shelter offered by the forest trees themselves being insufficient, and it is therefore unadvisable to plant cardamoms in exposed land.

*Aspect* is a matter of some importance, but the best aspect varies in different localities. Cardamoms are very capricious in their fruiting, and it is sometimes extremely difficult to say why they will not bear in certain localities, but there can be no doubt that this is the case. A very wet climate is unfavourable certainly, and so is a stiff clayey soil, in such places they will grow luxuriantly but bear little or no fruit.

In *clearing* forest land for cardamoms, the first thing is to cut down the undergrowth. This, allowed to decay, would render the subsequent planting operations very difficult; it is better therefore to make it into heaps, away from the standing trees, and burn it before it gets so dry as to allow of much heat being evolved, which might injure them. After this operation, the first weeding, which includes taking up the roots left in the ground, had better be done with mamoties, and is somewhat expensive. The real difficulty now arises, how much shade should be left? This is not easy to determine, and is a matter in which experience is the only guide. A chequered shade, admitting a fair amount of light and air, is what should be aimed at. It must be borne in mind though, that nothing is so easy as to *thin* the shade, whilst to increase it, if found too thin, is difficult if not impossible. Allowance must also be made for loss of trees from time to time, from wind, decay, &c. This loss is considerably greater than would be supposed, clearing the ground of the natural undergrowth having an ill-effect on the trees. Before planting, care should be taken that the shade is too dense, rather than too thin,—though, of course, the greatest amount of success would be obtained with the right degree of shade at first, as the plants do not come on quickly where it is excessive, and a tree should only be felled where several are growing close together and impeding one another.

On flats, where the soil is damp, *drains* should be cut to carry off the superfluous moisture, and dry the soil; for this purpose they should be 2 feet deep at least. This draining must be done in the usual way, one large outlet trench, of considerable size, with smaller drains branching off. On the slopes it is better not to drain at all where wash does not render it absolutely necessary, for the falling leaves and branches will be constantly choking the drains and causing them to

burst. There is seldom any wash of consequence in a cardamom clearing, and therefore draining is, as a rule, unnecessary; where this work has to be performed, the drains must be cut very large, at least two feet square, so as to be less liable to choke, but I should not advise its commencement until its necessity is apparent.

A cardamom clearing should be well *roaded* so that all parts may be readily accessible, and thus a check be more easily placed upon thieving. It is necessary to make very strict rules against pass within the boundaries of the clearing by coolies and strangers alike, and no main road should be conducted through it, if it can be avoided. All roads should have large and efficient back drains to them, and be at a gradient which will allow the water to run off. *Weeding* of a cardamom clearing, except the first mamoty weeding, which is almost a part of the "clearing," is a matter of very small moment, and a most trifling expense. Whilst the plants are young, the ground should be gone over every one, two, or three months according as it is naturally weedy or not. In most cases intervals of two months are not too long, a few weedy corners being cleaned oftener. In about two years' time, when the plants cover the ground, no weeding at all is necessary or advisable, for the fewer coolies that are allowed amongst the fruiting plants the better for the proprietor. It is unadvisable to give the weeding of a cardamom clearing on contract at any time; a few coolies, sent when other works do not press, are sufficient. The most important point is the weeding of *ravines*: these should be drained and planted if possible, but in any case must be kept thoroughly clean. If planted with grass, or allowed to remain full of jungle stuff, they harbour vermin which are most destructive to the crop.

*Lining*, or putting in the rows of pegs to indicate the intended position of the plants, is a somewhat troublesome operation in a shade clearing, the numerous trees making it a difficult matter to get the lines regular. It is best to use a short rope, with marks at the proper intervals along it, and to make the lines, as straight as possible under the circumstances. The best distance for cardamom plants is 7 ft.  $\times$  7 ft. in good soil. If the soil is at all inferior 6 ft.  $\times$  6 ft. would not be too close.

*Holes* or "pits" should be of good breadth, 18 inches or 2 feet, and 12 or 15 inches deep. They should be filled with good surface mould, sifted through the fingers, and freed from all stones and roots. Lining 7  $\times$  7, with 889 pegs to the acre, in a shade clearing may be estimated at R3 per acre, the use of a short rope being more expensive than of a long one. Holing will cost R8, allowing for a task of 50 holes per man, and filling in R4 per acre if carefully done.

Cardamoms can be *propagated* in two ways—by "bulbs" as they are generally called, and by seed. The former, which have hitherto been the more commonly used, are generally purchased from natives at prices varying from R10 to R25 per 1,000. In purchasing them,

great care must be taken that inferior plants are not mixed with the true Malabar cardamoms, as they may cause great loss and disappointment. The velvety feeling on the under surface of the leaf and leaf-sheaths, and the pure white or greenish colour of the bulb, the absence in fact of any suspicion of a pinkish tinge, are the best practical tests to distinguish Malabar cardamoms from the indigenous variety. Many of the bulbs will have no leaves adhering to them, but when such do exist they can be examined. The natives are very careless in cutting off bulbs from the growing plants, and many of the bulbs brought will be found greatly mutilated. Such should be rejected altogether, as they are not likely to come on. When the bulbs are to be taken from a plantation, a little care exercised in taking them will increase the percentage that grow considerably. A stool having been selected which is not fruiting, a hole should be cut a few inches from it about a foot in depth; the earth should then be cleared away by hand from underneath so much of the plant as is to be removed; then, with the greatest care, this part of the plant should be bent over until it breaks off naturally from the rest. In many cases, the separation can be effected without the use of a knife at all, and if so, all the better; sometimes, however, one or two cuts are necessary. The separated portion of the plant has then to be divided up into "bulbs," and this must be done entirely by hand. If held up in both hands, the weight of the stems is sufficient to detach the bulbs from one another with but little assistance. Unfortunately, this system is very destructive to the plantation. The wounded side of the plant as left in the ground, takes a long time to recover, and frequently such plants continue to bear on one side only, probably where the separation has been roughly effected. Besides this, the youngest bulbs are the ones most suitable for planting, and it is from these that racemes will spring to bear the crop, hence the difficulty of obtaining good young plants by purchase. The best and most satisfactory plan in the end is to select and mark out a portion of the clearing and uproot the whole of it. The plants so obtained must be divided up as described above, and some of them can be used for replanting the piece.

In buying bulbs, "double" ones alone should be taken. Natives will bring single ones, consisting of a stem and bulbous swelling at the bottom alone, if allowed to do so, at a comparatively low price, but such are quite worthless and sure to fail. A single bulb, if it has a well-developed shoot springing from it, and is not denuded of all its roots, will probably succeed; but "double bulbs," consisting of two stems connected together, with a shoot or two springing from their bases are the best. It is also advisable to see that the bulbs are fresh, and have not been a long time out of ground. This matter is of less importance in the case of cardamoms than of other plants, as they retain their vitality for a long time under adverse circumstances; still there can be no doubt that the fresher they are the better. The native vendors of cardamom bulbs buy them from the villagers

for a rupee a hundred on the spot, and in order to execute large orders have to procure them from numerous localities at once ; hence it frequently happens that a portion of the bulbs collected in this way deteriorate greatly before the full number is got together for delivery.

Cardamom bulbs can be procured through the Peradeniya Botanical Gardens from the villagers. This ensures the right kind alone being purchased, as great care is exercised in examining them before delivery. Those who do not feel quite certain of their ability to distinguish the right from the wrong kinds, would do well to take advantage of this.

However procured, the very best bulbs possible should alone be purchased. Attempts at economy in this matter are a great mistake and only result in loss. The most successful planting I ever did was by means of shoots from growing plants with a few roots attached, these appear to come on without a failure. It would be difficult to procure any quantity of these at the right stage, but the younger the bulbs are, the nearer they approach to shoots, the better. Where time is no object and can be afforded, it is an admirable plan to plant the bulbs in a nursery, uncovered, and to water them when necessary. If left in for a long enough time, they throw up numerous shoots. If these are broken off with a few roots attached, and planted, they will succeed admirably. There has been considerable prejudice against seedling plants which is only now beginning to be overcome : objections were raised to them on two grounds, they were said to take longer to come into bearing than bulbs, and doubts were expressed as to whether they would bear at all or not. This first objection is not altogether groundless, for the leaves of seedling plants often assume a ragged, untidy look, the growth of the plant being at the same time retarded ; but if the plants are of fair size, a foot in height say, with several stems, they appear to come into bearing as soon as bulbs ; the planting out of diminutive seedlings would, of course, not be successful. The second objection is altogether without foundation ; it could scarcely be otherwise, when we call to mind the Indian system of cultivation which consists in furthering the spontaneous growth of the seed of which the soil is full. Seedling plants have so many advantages over bulbs that it cannot be long before they, to a great extent, supercede the latter, but they must be large and well grown before being transplanted. In the first place the damage to growing plants where bulbs are taken from them is avoided, and that this damage may be very serious I have shewn. The extensive purchase of bulbs from natives has led to wholesale robberies of growing plantations, large numbers of plants being taken up and removed for sale ; in fact, in some instances, it seems extremely probable that planters have purchased the results of a successful raid on their neighbour's plantations, unwittingly. The transport of bulbs is a very serious expense, for a cooly can only carry a few hundred if they are large. Besides these objections to "bulb" planting, there is the

one great advantage of seedling plants that they can be raised on the spot, and this at a no great cost. The risk attending the purchase of bulbs, that they may be of an inferior variety, the extensive loss of plants where they are not good from careless cutting or long exposure, the great expense in original purchase as well as transport, are disadvantages which are all more or less obviated by the use of seedling plants. The latter, to be successful, should be of good size when planted out; they should be from six inches to a foot high with several leaf stem. The "Mysore" variety of cardamoms is found to make a more successful nursery than the Malabar, the seedlings standing transplanting better.

The actual planting of bulbs or plants is an easy matter. The roots, if too long, having been shortened with a knife, the plant is put in the usual way with the roots spread out. The greatest care must be taken that they are not put in too deep, as in this case bulbs are almost sure to rot off; the soil should hardly cover the bulb, leaving the bottom of the stem above ground. The soil should be firmly pressed down by hand, but should not be trodden down.

On no account should cardamom bulbs be planted on the top of heaped up soil, for this is a great mistake under shade, as the drip from the trees soon washes away the soil from the plant, leaving the roots exposed.

Seed for *nurseries* should be very carefully selected and prepared. Fully ripe fruit, of a yellowish colour, should be picked, and the seeds squeezed out of the skin. These will then be found covered with a glutinous substance which causes them to adhere together in little masses; to free them from this, a short exposure to the sun or a current of air is necessary. The former is most effectual, and in a short time they become dry. The seed should then be steeped in water for a few hours and thinly sown in nursery beds, the surface of which may consist of a mixture of sand and vegetable mould. Ferns stuck in over the bed, in the same manner as for cinchona nurseries, will be found fairly successful, but a water-tight roof of cadjans or thatch is best. The seed should be kept damp by occasional watering, but should not be over-watered. The period within which the seed germinates depends entirely on the temperature, that is on the elevation. In the lowcountry the seed will be above ground in three weeks, whereas at an elevation of 4,000 feet, it takes as many months and sometimes even longer. It is therefore advisable to make the nursery at as low an elevation as possible, if for Malabar seed, indeed a successful nursery at high elevation is very improbable, the plant being very slow of growth, and damping off in a most disheartening way. Mysore cardamoms are, on the contrary, comparatively easily grown from seed. 1 lb. of fresh fruit will be found to contain on an average 776 capsules, each containing an average of 16 to 17 seeds. Thus 1 lb. fresh fruit equals 12,804 seeds. 10 lb. fresh fruit will produce about 2½ lb. seed. 1 lb. seed therefore contains about 50,000 seeds, but a small propor-



tion only appears to germinate as a rule. Cardamom seedlings are very liable to damp off when young, large numbers being frequently lost in this way ; the beds should therefore be well drained and sloped. When small the seedlings will not bear transplanting, in fact at any age they can only be moved at considerable risk. The best plan is therefore to sow the seed thinly so that the plants may be allowed to attain a good size without undue crowding, say 1 foot in height, when they may be moved direct to the field with as little disturbance of the roots as possible. If, however, it is necessary to prick them out, the employment of baskets is advisable, and will be found an economy in the end. If pricked out into beds, in the ordinary way, and again transplanted to the field, large numbers are sure to be lost. They should not in that case be removed from the seed beds until they are three inches or more in height, and have got their second leaves.

As soon as the plants begin to throw out racemes, it is advisable to clear away all rubbish from about them, and to prune off the dead and dying stems which choke the plant. After they begin to fruit, it will be sufficient to make the pickers carry knives and do this, but on no account should a healthy stem ever be cut.

At a medium elevation cardamoms yield a small maiden crop in 3 years' time from date of planting, partial crop in four years, and a full crop in five years. The first crop is generally unfavourably influenced by insect and other enemies, and by the proportion of supplies not bearing ; and it is really only during the 5th year that the full yield is obtained. As to the duration of cropping we have much to learn ; in India they continue productive for six or seven years, and in Ceylon, by judicious cultivation, we ought to be able to extend this period. The yield per acre, *under favourable conditions*, is very large ; 150 lb. per acre in the 4th year and 300 lb. in the 5th is what may be looked for, and this latter yield is what ought to be given annually with good seasons. The plants blossom more or less almost all the year round, but chiefly from January to May. Picking begins at the end of August or beginning of September and lasts till April, from September to December being the busiest months. This protracted crop season, complicated by the presence of blossom and large quantities of immature fruit, make picking an expensive and difficult operation, requiring most careful supervision. In India, the method in vogue amongst the natives and amongst Europeans, too, as far as one hears, is to pull off the racemes with the fruit attached, in all stages of growth, from the recently formed and immature fruit to the fully ripened yellow capsule. The loss sustained by following such an extremely primitive method of cultivation must be immense. For the racemes do not finish their work in a single year, but appear to bear fruit at least for a second season, whilst the unformed capsules are of course of little value. It has been found by experience that fruit pulled off the plant is certain to split in curing. The only way to obviate this is to remove the fruit with the stalk attached, and to do

this scissors must be employed. The expense of such a system is, of course, great, but in order to obtain what is required for the English market, a perfect capsule, it is necessary. The removal of the whole raceme with fruit attached, and the removal of the fruit after drying, would be an effectual method, but when we consider that the ripening of the crop extends over at least 8 months, it would be difficult to fix on any time to do this without losing a very large proportion. When the fruit is fully ripe, it turns a deep yellow, and is then very difficult to cure properly. The least touch detaches it from the stalk, and hence the picking is very difficult; whilst, when in this stage, it constantly splits in drying even though the stalk is attached to it. It fortunately happens, however, that the seeds turn black, and gain their aroma, before the capsule enclosing them turns a full yellow, and this is the most favourable time for picking in every way. Considerable practice is necessary before the coolies can tell what to pick and what to leave; a slight turn of colour is some guide, and the firmness of the capsule, which is soft and yielding when unripe, is an indication of maturity.

The tiresome nature of this work makes the coolies apt to get careless at it, and they require very close looking after. They should be made to take the racemes up in the left hand, one by one, and with the right cut off all the ripening fruit. On no account should they hold the fruit itself whilst cutting it, as, if at all ripe, it will probably become detached from the stalk. A certain amount of fruit, growing amongst the stems of the plant, and out of reach of the scissors, must be pulled off, but the proportion of this is small. In a good picking, coolies who are accustomed to the work will bring in from 12 lb. to 15 lb. fruit; from 8 lb. to 10 lb. per head is an average picking. As the outturn of dried fruit to fresh is about as 1 to 4, and taking 8 lb. per head as the average picking, the cost of this work amounts to 18 cents per lb. say.

For the protection of the crop during the season, and indeed at all times, for the bulbs are as liable to be stolen as the fruit, a night watchman with a gun is absolutely necessary, and it is also well to have some one in charge during the day too.

It is to be noted that the first or maiden crop always yields larger fruit capsules than the succeeding ones, and that the earlier pickings each year shew a larger sample than the late ones.

For cutting the fruit ordinary scissors are not suitable, as the rough work in the field soon makes the screws get loose, when it becomes very difficult to cut off the fruit with long blades. The most suitable scissors have very short cutting blades, and a very long handle, the former one inch, the latter four inches in length; a special pattern, which I have had made in England, increases the quality of the work greatly, and they are very much less liable to get out of order. The scissors can be purchased of Messrs. John Walker & Co. of Colombo and Kandy.

Our object in *curing* is to give the fruit when dry a light straw colour, with no black or brown spots about it, and to effect this with

as little being split as possible. A certain proportion of split, composed chiefly of over-ripe fruit, is unavoidable, but our endeavour should be to reduce this to a minimum. The curing of cardamoms is a very simple matter in dry weather, sun drying being the most effective and cheapest method. Long exposure to the sun during hot weather, the attempt in fact to dry the fruit quickly, is a mistake, for the seed inside gets heated, swells, and bursts its covering. Three hours' exposure in the morning and two hours in the afternoon is as much as it is safe to give. In showery and unsettled weather, of course, full advantage must be taken of whatever sunshine there is. The slower the drying process, the smaller is the proportion of split fruit, and hence too protracted exposure to the sun or to artificial heat should be avoided. In order that the fruit shall attain the much desired pale straw colour, the bleaching action of the sun's direct rays are absolutely essential. In wet weather, the drying must, of course, be conducted artificially, but the fruit then dries a brown colour and fetches a lower price. When drying the fruit by artificial heat, great care must be taken not to conduct the process too quickly: a gentle warmth is all that is necessary.

In making a drying room for cardamoms the first essential is a ready means of ingress and egress for the trays containing the fruit, for in unsettled weather these have to be run out and taken in at short intervals. A very good plan to obviate the necessity for taking in the trays when a shower threatens is to have wooden rails on the drying ground, raised three feet above the surface, on which the trays can be placed, and to have a waterproof covering, a tarpaulin in fact, which can be readily spread over the trays on the approach of a shower. A good stove is a necessity in the drying room for keeping the fruit from getting mouldy in wet weather. The colour of the cardamoms can be greatly improved by *slightly* bleaching them, and the most obvious way is a sprinkling of water, or a short steeping in water, and then instant exposure to the sun—the principle in fact which guides the laundress when she sprinkles her linen with water, and exposes it to the sun to bleach. It is difficult, however, to do this without increasing the proportion of split fruit considerably, and in fine weather, the cardamoms naturally assume a very good colour without artificial treatment. It has been recommended by a correspondent of the *Observer* to steep the fruit in boiling water for a minute as an improvement to the colour: this process bleaches the fruit excessively, more so than would be appreciated by London brokers. Split cardamoms are generally sold locally at prices varying from 75c. to R1.50 per lb., whilst good unsplit fruit realises from 7s to 9s per lb. in the London Market.

When dried, and before packing, it is necessary to “clip” the cardamoms, that is, to cut off the stalk and the little dried tuft at the top. This is a very expensive and tedious process, but it is unavoidable if the fruit is to be sent to the London market for sale. In India

this process is effected by rubbing the dried fruit against the bottom of a basket, but by this means many capsules are split and broken, and the work is ineffectually done. The most effective way is to have the stalks cut off by scissors, and this work affords welcome employment to the numerous ineffective hands for whom work has to be found on all estates. The amount clipped depends on the size of the fruit, but with plants in full bearing, when the sample is a very small one, (n) 3 lb. is as much as a cooly can clip in a day with practice, and this includes the picking out of split and brown capsules. Amongst the unsplit capsules, three qualities are distinguishable: the perfectly cured ones of a light straw colour, those which have a brownish tinge or are slightly discoloured on one side, and those which are nearly black, generally from having been picked and cured in unfavourable weather; the clippers should keep these qualities separate. The distinctions of "longs," "short longs," &c., do not seem to have any value, and the classification according to color is quite sufficient.

The cardamom *curing house* is a very simple building: all that is necessary is a series of racks to support tiers of moveable trays to hold the fruit. A tray 6' x 3' will hold about 15 lb. fresh fruit. In dry weather it is well for the walls to be open, to allow a free circulation of air. But in wet weather, closed walls and the heat of a stove are necessary. The best system is therefore to have louver-boardings or open trellis work round the room, with plain shutters which can be put up to exclude the air when required. There should also be as many glazed windows as possible to admit plenty of light.

The best material for the trays is fine brass wire gauze (24 meshes to the inch), but this is very expensive. A cheap material is split bamboo, but as the seed from the split cardamoms falls through this, a certain proportion of the trays must be covered with cloth or gunny bags; in almost all cases an existing building of some kind is available for cardamoms, and only requires fitting with the necessary trays and a stove. Where the quantity of fruit to be dried is great, and much room is required, two stoves are necessary. These can be placed one at each end of the room, and the piping be conducted from them to the center of the room, and there communicate with a single vertical pipe conveying the smoke outside the building. By this arrangement every advantage will be taken to economise heat.

The rules regarding "drafts" in the London market are as follows:—None if gross weight of package be under 28 lb. In the case of large packages 1 lb. if weight of empty case be not more than 28 lb., 2 lb., if it be over 28 lb., and no more whatever the size may be. A wooden case to contain 65 lb. nett, and measuring 1' 10½" x 1' 3" x 12" inside, will have a tare of about 25 lb., and this is a very convenient size of package. Lead or zinc lining are not recommended, the best lining is light gunny cloth. In packing, great care should be

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(n). Ordinary seized 5 lb., large 6 lb.

exercised that the cardamoms are *perfectly dry*, and they should be packed warm from the sun.

Regarding *pruning* and *manuring* but little is known. No succulent stalk, even though partially broken off by wind, should ever be removed, but dead stalks should be regularly pulled out by the pickers as otherwise they rot, and the rotting extends to the healthy portions of the plant. When the centre of the stool begins to show signs of decay, the dying rhizomes should all be pulled out, and the centres thoroughly cleared of all debris, earth being thrown over the place from which they have been removed: this stimulates the growth of fresh shoots inwards. Manuring should certainly be tried, but we have no data on the subject as yet. Paddy husk is the manure commonly applied by the natives, and is said to have a beneficial effect on the plants. There can be little doubt but that cardamoms, like all other plants, will benefit by manuring; the thorough clearing of all leaves and rubbish to a distance of two feet and the clearing of the shoots from dying stems and the application of earth is, however, a great restorative.

Of the *enemies* which attack cardamoms the most serious is an insect which bores a circular hole in the capsules and cleans out the inside, young plantations seem much more liable to this pest than older ones, in the former case as much as 80 to 90 per cent will sometimes be attacked and destroyed in this way; promixity to patanas seems also the cause of increased liability to these attacks. Applications of wood-ash, lime or anything of a like nature, are said to be beneficial. Rats (*o*) are at all times most destructive, heaps of empty capsules will generally be found at the mouths of their holes, and the amount of loss which is thus sustained by the end of the crop season is difficult to estimate. The clearing of ravines which usually harbour them, and the opening-out of a broad belt along the edge of any forest or chena, will be found of marked benefit. Poison is, however, an obvious means of lessening the pests. Wild pigs are also very destructive, for they not only do damage by destroying the racemes, but they are fond of gnawing the rhizomes themselves. The worst drawback, especially in certain neighbourhoods, is the liability to which planted clearings or fruit-bearing plantations are exposed to robbery, the high value which at present attaches to cardamom bulbs, and the necessity in most cases of obtaining them from villagers, is a great incentive to the robbery from young clearings of the growing plants. Robberies of fruit are very common, and the heartless way in which they are generally conducted is terrible; gangs of men frequently come, select the most heavily-bearing stools, and denude them of their whole crop of racemes, green fruit, ripe fruit, blossom, and all. The facility with which a robbery of this kind may be effected, the value of the proceeds, the ease with

which they may be disposed of, and the utter futility of the attempts to bring the robberies home to the perpetrators, make this line of business peculiarly attractive to the native mind. One or more night watchmen are absolutely necessary in most neighbourhoods. The natural enemies of cardamoms enumerated above by no means exhaust the list; the pungent fruit appears to offer attractions to all members alike of the animal kingdom, and losses in this respect must be calculated upon and allowed for in estimating the returns of produce. In wet seasons very serious loss is sustained by the rotting of fruit and racemes when immature; there is apparently no way of preventing this. The rotten portions should be cut off the plants by the pickers and cured separately.

### ESTIMATES.

Estimate of Expenditure and Returns on 25 acres of Cardamoms, managed from an adjoining estate:—				R.	R.
1st Year.—Value of land at R100 per acre				2,500	
Clearing undergrowth and 1st Weeding at R15				375	
Lining, Holing, Planting and Supplying at R20				500	
Superintendence				500	
Cost of 37,500 good double bulbs, allowing 50 per cent for supplies, at R30 per 1,000				1,125	
Tools, &c.				100	
Roads and Weeding				200	
Cost at end of 1st year (plants 1 year old)				—	5,300
2nd Year.—Supplying and cost of Bulbs				200	
Weeding				125	
Superintendence				500	
Contingencies				100	
					925
Cost at end of 2nd year (plants 2 years old)				—	6,225
3rd Year.—Expenditure 3rd year as before				—	925
Cost at end of 3rd year (plants 3 years old)				—	7,150
4th Year.—Superintendence and Contingencies				600	
Erection of Curing House, including cost of Scissors, &c.				1,000	
Picking, Curing, Clipping, Packing and Transporting 3,750 lb. dry fruit at 40 cents per lb.				1,500	3,100
Cost at end of 4th year (plants 4 years old)				—	10,250
Receipts 3,250 lb. at R2				R6,500	
500 lb. split at R0.75				R375	
					6,875
					3,375
5th Year.—Superintendence and Contingencies				600	
Pruning and Clearing stools				100	
Picking, &c. as before 6,250 lb. at 40 cents...				2,500	3,200
Cost at end of 5th year (plants 5 years old)				—	6,575
Receipts 5,400 lb. at R2				R10,800	
850 lb. split at R0.75				R637	
					11,437
PROFIT					4,862


## NOTES ON ESTIMATE.

- 1st Year.—The allowance of 50 per cent supplies may seem large, but it is very likely to be required when the bulbs have to be carried far. If seedlings are employed the cost would be much lessened, but a year would be lost. The other items need no comment.
- 2nd Year.—Supplying allows for the failure of 25 per cent of the first year's planting. Weeding will be necessary this year, but is very inexpensive under forest shade if the forest clearing has been effective.
- 3rd Year.—The same expenditure is allowed for the 3rd as for the 2nd year, and should suffice for putting ravines into order and clearing jungle edges, as to the actual weeding would be almost nil.
- 4th Year.—The Rs1,000 allowed for a curing house should allow ample margin for all expenses of erecting a special building for the purpose; in most cases a large portion of this outlay can be saved by the adaptation of some existing building to the purpose. No crop is estimated for before this year. At low elevations there would be a maiden crop in the third year, and there would certainly be some crop then higher up, but this has been left out of the calculation, as its amount is uncertain, and dependent on a greater degree of success at the outset than is usual in cardamom clearings. The estimated amount per acre, 150 lb., is what may be expected in suitable localities, and under fairly favourable circumstances (cardamoms should not be planted otherwise), and is the outcome of actual experience. The proportion of split fruit will generally, during a whole season, amount to from ten to fifteen per cent of the crop, depending entirely on the amount of care taken with the picking and curing; the allowance here made is very high, and certainly should not be exceeded under any circumstances. The cost of picking and curing, 40 cents, allows a good margin for all expenses from the time the fruit is picked to its delivery in Colombo. The present rate at which split cardamoms sell varies from one rupee to a rupee and a half, according to quality at recent prices, 3 lb. well cured fruit may be calculated to *nett* one pound sterling. The course of the market is no doubt very uncertain, and if production were to increase to any great extent it would soon be glutted and prices fall considerably.
- 5th Year.—250 lb. per acre is the estimated crop in the fifth year; this is below the actual results of my experience, and 300 lb. might be safely relied on in *favourable localities*. After the fifth year there will probably be a falling-off in the yield, or, at any rate, there will be no increase, for the first full crop appears generally to be the best. *Cultivation*, in the form of careful attention to clearing out and pruning, now becomes necessary.

From this year too the sample of fruit will become very much smaller, and hence the cost of picking, &c., will probably rise to nearly 50 cents per lb. A considerable profit may fairly be looked for annually, but the rate of production during the early crops must not be expected to continue. As before stated, also the effect of prolonged and abnormal wet weather is most disastrous and disappointing.

## CARDAMOM CURING.

The following description is only applicable where there is no Cardamom house, with stove and all the other appliances for doing the thing well :—

In gathering Cardamoms a pair of scissors should be used to clip the fruit from the fruit-bearing stalk, when the fruit is sufficiently ripe for gathering the portion marked A. has withered back to B,  and

the seeds have turned from white to lead color or nearly brown. A day's gathering should be thrown into a large tub or box at 4 p.m. and thoroughly washed in cold water. After washing the fruit, they can be taken out of the water and put into a box or sack over night. Next morning wash the fruit again and then spread them out on Hessian cloth or mats in the sun. About 9 a.m. they begin to get dry; they should then be sprinkled with water from a watering can and given a shake up, so that all the fruit shall get wet. Expose them to the sun again to dry, and when they look dry say about 11 o'clock, water them again as before; water them three or four times a day, for the first two days after which you can begin to dry them gradually (without watering). This is done by exposing them daily in the sun, say from 6 a.m. to 11 and from 1 p.m. to 4 p.m., from 11 to 1 o'clock, if the sun is very hot, draw a thin cloth or mat over the fruit while on the bartacue in the sun. This process of drying must be carried on daily for a fortnight, or perhaps more, until the fruit is thoroughly dried. During the night spread them out thinly over your store floor, away from any chance of their getting damp, as damp or mildew is bad for them.

When thoroughly dried, you then put coolies on to clip off both ends (after sifting and putting to one side all husks or light fruit). The coolies clipping separate the broken (or open fruit,) from the good, they clip the broken as well as the whole fruit. After clipping, you then size the fruit by passing them through small sieves, making three grades of fruit, the husks and light are kept separate from the broken, and the seeds which may fall from the broken fruit are also kept separate.

After sizing is finished, the fruit is then sulphured in a box prepared for the purpose. The box is made to hold a number of trays, or tats, say 1½" square frame. On this nail cane or bamboo tats or open jute hessian cloth. From the bottom of the box to the first tray there should be at least a foot clear space for placing the sulphur which is put in tin saucers. It is well to have the saucer resting on a stone while the sulphur is burning in the box.

