

Cultivation and Marketing of Lanka Tobacco (Godavari Dt.)

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Among the provinces of India, Madras takes the first place with regard to consumption of tobacco in the form of cigars and *cheroots*. The annual per capita consumption is 372,* and in the districts of Godavary and Vizagapatam the use of *cheroot* is almost universal. Tobacco cultivated in the *Lankas* (islands) of Godavary otherwise known as Lanka tobacco is famous and popular throughout the Northern Circars as the best among the varieties grown for *cheroots*. This is chiefly due to the mild agreeable flavour, even burning and white ash qualities of the variety.

Lankas are islands formed in the river beds of the Godavary. Depending upon the nature of permanency, fertility value estimated on the amount of the silt deposited and cultivable nature of the soil, the *lankas* are classified into three main classes. A. Class :— These are high level *lankas* and are free from easy submersion by floods. The chief crops raised in these are paddy, sorghum and tobacco. Major portions are set apart for grazing so as to give a chance of fallowing. These *lankas* are given on lease to the *ryots* for fixed terms of 10 to 20 years in public auction. The auction value generally ranges from Rs. 15 to 20 per acre per year.

B. Class :— These are subject to submersion when floods are very high in the river. The chief crops raised in them are tobacco, paddy and sorghum. These are leased out in public auction for fixed terms of 3 years. The value of auction varies from Rs. 30 to 50 per acre per year.

C. Class :— These are low-lying *lankas* and are often subject to submersion and heavy flooding, which makes their position very uncertain. As such they are annually leased out in public auction. The lands are heavily silted and very fertile. The chief crops raised are tobacco and sorghum. The auction value may range from Rs. 60 to 80 per acre per year.

In all the three types of *lankas* where tobacco is planted the growers resort to a practice known as the *Kavu* process. This consists in the removal of any sand found in the sub-soil (one foot below) and replacing it with silt. The River Conservancy Department generally plant *Nanal* (*Saccharum spontaneum*) to protect the embankments from erosion. This obstructs the flow of flood water and helps in the deposition of silt. The depth of silt accumulation of these *lankas* varies considerably. The high level *lankas* suffer from erosion of the top soil while the lowlying *lankas* are subject to sand casting or accretions, and in either case the loss has to be borne by the growers. The Government allows no remission or refund of the lease

* Vide *Report on the Marketing of Tobacco in India and Burma*, page 78, A. M. A 10/1400, Government of India,

amount except in cases where a portion of the *lanka* is completely eroded and forms a part of the river. In the case of accretions the *ryot* is not allowed to cultivate the new area. No water rate is charged for the *lankas*. The auction generally takes place during March and April, and the old tenants have to quit before the 15th of May.

Details of cultivation. *Soils.* The soils of the *lankas* in which the tobacco crop is raised are well drained, light, sandy loams, retentive of moisture, being mostly river silt. They become fertile due to the floods of the Godavary river.

Area. On an average the annual area under this type of tobacco will be 20,000 acres in the two districts of East and West Godavary.

Rotation. Tobacco is grown from September to March. In the *lankas* of the East Godavary District tobacco and chillies are grown in rotation with sorghum. In the high level lands bordering the river Godavary and its deltaic branches, subject to flooding during the South West Monsoon, *Patcha jonna* (yellow sorghum) is grown. A certain type of four course rotation is in practice round about the *lankas* of Amalapuram taluk, tobacco being raised for the first two years successively, followed by chillies and sorghum in the next two years. The *lanka* is then left as a *Beedu* (grazing ground), and the cultivation is shifted to another virgin *lanka*. In certain *lankas*, known as *Oota lanka*, a two course rotation is adopted, *Budama* paddy or chillies succeeding the tobacco crop. A rotation of *Budama* paddy or sorghum followed by chillies is practised in certain parts of the *Kotipalli lanka*.

Nursery. The successful raising of a nursery requires great skill and experience. High level lands with good irrigation and drainage facilities are always selected for the nursery. The plot is first cleared of weeds and stones. Three ploughings are given after penning cattle. Feeding cattle with green sunhemp fodder during the course of penning is considered to produce vigorous and healthy seedlings. The land is finally brought to a very fine tilth and divided into long narrow beds of 40 ft. by 21 ft., with irrigation and drainage channels. Square beds of the size 8 ft. by 8 ft. are also common round about *Kotipalli lanka*. The seed beds are finally levelled. About 2 to 3 tolas of well preserved seed is mixed with fine sand in the proportion of 1 to 16 and sown on or before 15th of September. The mixture is evenly sprinkled in four casts to ensure uniform spread of the seed. The beds are lightly stirred with a broad broom prepared out of dry redgram stalks. On the next day early in the morning water is sprinkled over the beds and once again they are lightly stirred with the broom. The prevalence of cool and cloudy weather at the time of raising the nurseries coupled with the constant watering of the beds to keep them moist obviates the necessity for shading the nursery. From the third day till seven days pot watering is done about six to eight times per day depending upon the weather. In a week from the date of sowing the seeds begin to germinate. From the date of germination for a period of eight days pot

watering is done thrice a day and later for a period of 16 days watering is done twice a day. During the next eight days watering is increased to four times a day to facilitate quick and vigorous growth of the seedlings. Thus after a period of 40 to 45 days from the date of sowing seedling will be ready for transplantation. Whenever found essential weeding is attended to in the nursery beds About $1\frac{1}{2}$ to 2 cents of the seed bed is raised for each acre of the main field.

Preparatory cultivation of the main field. The nature of preparatory cultivation depends on the type of *lanka* selected. If it is a newly formed one the land is first given a thorough digging and it is ploughed 10 to 12 times and brought to condition. If it is a '*Beedu*' (cultivated and left fallow for 3 or 4 years) the grass is cut and the soil dug and ploughed. If it is a '*Chalaka*' (land in which only one crop of tobacco was already raised) 10 to 12 ploughings are given. The preparatory cultivation commences by about September and the fields will be ready for transplantation in November.

Manuring. Manuring is not at all practised, as the *lanka* selected for raising the crop may be a newly formed one with a deposit of silt of high fertility or a *beedu* fallowed for 3 or 4 years, or land in which only one crop was raised.

Planting. After the preparation of the main field, planting commences during the first week of November. The seedlings are planted in holes two feet apart both ways made with a local hand tool called *Gouddalikam* (a hand hoe with a long handle enabling one to work while standing). The planting holes are first watered and then planted with the seedlings. The first watering is locally termed as *Yeta pota* (meaning watering for planting). The skill of the labourers is such that even without any preliminary marking, planting will be in straight lines with accurate spacings. About 10,890 seedlings are required to plant an acre. As the weather at this period is cool and cloudy with incessant moist breeze from the Godavary river shading of the planted seedlings is not essential.

Irrigation. On the next day after planting early in the morning a pot watering, known locally as *Chali pota* (watering for establishment) is given. On the third day another watering, called locally as *Puli pota* (watering for growth) is given, after which no watering is done till the seventh day. On the seventh day along with pot watering gaps are filled up. This is the final watering and from thence the entire crop is treated dry in fairly rich soils. But in poor soils where rains fail one or two irrigations are given to prevent the crop from drying up.

After cultivation. Fifteen days after planting a weeding is done. One month later a *mamuti* hoeing is usually given. No other inter-cultivation is done except one more weeding if found essential. When the plants are 50 days old from the date of planting they begin to put forth flowers. A few well grown and healthy plants are allowed to flower and

set seed while the rest are topped, leaving about 10 well developed leaves per plant. Ten days after topping, suckering will commence which will be repeated thrice at intervals of eight days.

Pests and Diseases. Of the insect pests affecting the crop the tobacco caterpillar (*Prodenia litura*) is the most serious one. The only remedial measure in practice is the careful examination of the under surface of the leaves to destroy the egg masses. The next important pest is the tobacco Aphis. It takes a heavy toll of the crop in certain years. In cases of severe infestation spraying of the crop with tobacco decoction gives good results. The parasitic plant *Orobanche* (*Bodu* or *Malli*), appears in fields continuously cropped with tobacco. The ravages of the parasite are not severe at any rate in the *lankas* in view of the good rotation and fallowing. Only weeding out of the parasitic plants and their destruction is the control measure in practice. A common fungus disease is the Mildew, locally known as *Challa* in which the basal leaves become completely withered and coated with white powdery patches. Such leaves are locally known as *Tepāaku*. When the infestation is found to be serious the affected leaves are removed. Another disease, locally known as *Karru* affects the leaves with red stripes on them and this is believed to be due to the use of aged seedlings of more than 45 days.

Harvesting. The crop is generally ready for harvest in about 95 to 100 days from the date of planting. The arched development of the lower leaves and their general thickening with light yellowish oval spots (locally called as *Kandi badda pōda*) on the top 3 or 4 leaves are the chief signs of maturity. On any convenient day not exceeding 105 days the plants are cut in the evening at about 4 P. M. If necessary the harvest will be continued during the nights also. A peculiar feature of the harvest is that each leaf is cut from the plant along with about half the internode on either side of the leaf with the aid of a small, un-serrated, sharp sickle while the crop is standing on the field. This type of harvest is locally termed as *Chettu meeda kota* (harvesting on the plant). The entire cut crop is left in the field till the next morning when it is removed to thatched sheds for curing.

Curing. The stuff brought from the field is arranged into a circular heap with the butt ends inside and tips outside on a clean even moistened mud floor. Towards the evening they are taken out and the leaves are stitched with a needle and fibre of *Agave* (*Kittanara*). Ten leaves with backs of their midribs touching one another are stitched to form one unit (bundle). These bundles are then taken to the curing sheds. These are temporary sheds built in the open field near the river bed in the direction of the wind which favours the process of curing. A typical shed measures 48' × 25' × 14' in length, breadth and height respectively. The space inside is divided with bamboos into compartments 5½' × 5½' × 2½'. Coir strings are tied lengthwise in the shed in each compartment 4 in. apart. On these

strings the stitched bundles are arranged such that the successive leaves are on the alternate side of the string. A shed of the above dimensions can hold the produce of two acres at a time. It takes 25 to 30 days for complete curing. During the curing season which lasts for two and a half months (January 15 to end of March) three curings can be made. Thus for each unit of six acres a shed of the above dimensions is necessary. The absence of any traces of greenness on the internodes and veins of the leaf and the general softness of the leaf are the indications of perfect curing. The bundles are then removed from strings and arranged into circular heaps of about 200 mds. each. The heaps are changed and rebuilt twice a day. During the second change the bottom portion of the leaf is dipped in water and carefully examined, for rectification of wrinkles of the leaf if any. After two days the heap is taken out and graded. The graded leaves are arranged into bundles known as *Chattolu*. These bundles are packed in palmyra leaf mats and weigh about 200 lb. each.

Grading. Systematic grading based on colour, size, condition and aroma of the leaf is not practised. However every tobacco grower clearly recognises five grades in the stuff he produces and the chief factors that have a bearing on these grades are the colour, weight and the position of the leaf on the plant. The top ones fetch the highest price and the bottom ones the lowest. An ideal *cheroot* leaf of the *lanka* tobacco possesses the following qualities:--

- i) Colour—Light to dark brown.
- ii) Texture—Leaf of medium thickness, pliable and smooth, the veins being less prominent.
- iii) Size—The wrapper should be 9 to 12 in. broad and 24 in. long but the size is unimportant for a filler.
- iv) Strength—Mild.
- v) Blemish—Free from all disease spots or patches.
- vi) Burning quality—Slow, regular and continuous burning is required. Evenness of burning is more important.
- vii) Ash—Whitish colour.
- viii) Flavour and aroma—Agreeable and pleasing.

It may be stated here that there is always an appreciable variation in the quality of tobacco grown in different *lankas*. Tobacco produced on certain *lankas* has a great reputation and fetch a better price. Owing to this variation in quality buyers proceed from place to place to collect the best stuff leaving no opportunity for the producers to get it to a central market for sale. The table below gives the five grades with their local terms, their relative market values and percentage of yield of each grade to the total yield of the stuff per acre.

Grade designation:	Local name.	Yield per acre lb.	Percent. of each grade of the total yield.	Value per Md. (20 lb.)	Total value of each grade.	Remarks
1	2	3	4	5	6	7
First	Koti	40	5	Rs. 24	Rs. 48	2 or 3 leaves from top.
Second	Baru	400	53	16	320	Next 3 leaves.
Third	Mattasam	160	22	12	96	Next 2 leaves.
Fourth	Gulla	120	16	5	30	Next 1 or 2 leaves.
Fifth	Tepa	30	4	2	3	Rest of the leaves.
Total.		750	100	—	497	—

Marketing Season. Unlike other agricultural commodities the sales of tobacco are pushed up in post-harvest months (April to August) owing to the fear of the deterioration of the quality of the stuff at later periods. Thus the season commences with April and usually extends up to August. The period of peak transactions is between May and July.

Markets. The markets of Rajahmundry and Cocanada are principal assembling centres for Lanka Tobacco. The sellers at these markets are mostly the merchants who make their primary purchases in the villages. This practice probably continues in the absence of systematic and organised grading, and marketing. The establishment of a few markets in some of the important producing centres where growers could bring their tobacco for sale would go a long way in improving and standardising the prices.

Quality and Price. It is important to emphasise that the price is entirely dependent on the quality of the leaf graded according to the position of the leaf on the plant. Generally a striking difference of 35 to 40 per cent. prevails between the first and second grades.

Demand. There is a good demand for the tobacco throughout the districts of East and West Godavary, parts of Vizagapatam and Kistna. In general the habitual smokers are so particular of this type of tobacco, that they make certain of their purchase soon after curing from reputed *lankas*. The demand for *cheroots* is least in summer and highest during the winter.

Storage. Generally growers prefer to dispose off the stocks at the earliest opportunity for fear of losses during storage and want of adequate facilities to store the same. In spite of few instances where the growers that stored the stuff derived gain, it is admitted by many that profiteering by holding of stocks for sale at later periods is uncertain. During storage, the losses through dryage, and other causes amount to 35 to 40 per cent.

Manufacture of cheroots—A cottage industry. The Lanka tobacco is solely used for the manufacture of *cheroots* and this is mostly carried on

as a cottage industry. Like many other artisans the Indian cigar maker works with very few tools; a small board, a pair of scissors, a smooth stone to serve as a pounder and a double edged curved knife are all that he requires. From a bundle by his side he draws out leaf by leaf and tears off the midrib and passes the remainder to his assistant who sorts it out into varieties, the best to be used as wrapper and the rest as filler. The busy assistant first shapes out a rough cigar and covers it with a coarse binder of tobacco. This is the core and it is further shaped by rolling on the board. Much skill and dexterity are required here, for care must be taken not to choke the air passages and at the same time the appearance must be maintained. After rolling, the outer cover, called the robe or wrapper, is put on and the ends scissored off. A *cheroot* man and his assistant can roll about 800 to 1,000 *cheroots* in a day of eight hours and their wages vary from 12 annas to Rs. 2 per 1,000 according to the finish and quality. About 2,400 to 3,000 *cheroots* can be prepared from a maund of the tobacco depending on the size of the *cheroot*.

Economics of Cultivation. The cost of cultivation as shown below comes to Rs. 85-8-0 per acre including the rental value. If the cultivator is a tenant the rental value will be very high amounting to Rs. 250 to 300 per acre per year. The gross income from one acre will be Rs. 497 and the net income left to the tenant will be Rs. 162.

Conclusion. The high profits obtained may attract every one to take up to cultivation of this crop. But there are a number of risks to be faced, namely,—weather conditions like rain and drought, erosion, accretions on the land, incidence of pests and diseases, etc. These factors also adversely affect the quality of the final product resulting in the reduction of the nett returns. Only in years when all the conditions are normal the indicated profits are realised and this may happen once in five or six years. The crop is cultivated by a group of six to eight *ryots* in large holdings of 20 to 25 acres. Instances of smaller holdings of 2 to 3 acres managed by individual *ryots* are not wanting. Although all the agricultural classes take up to it, monopoly is held by the *Kammas*, an important agricultural community of the tract.

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Details of cost of cultivation per acre.

Digging up grass and removal of stubbles on contract at Rs. 12 per acre	12	0	0
Twelve ploughings with a country plough	...	...	15 0 0
Cost of nursery to transplant an acre of the main field	...	...	8 0 0
Planting—10 women at 4 annas each	...	...	2 8 0
Gap filling—2 women at 4 annas each	...	...	0 8 0

Mamuti hoeing—10 men at 6 annas each	...	...	...	3 12 0
First weeding—10 women at 4 annas each	...	...	...	2 8 0
Second weeding—8 " " "	...	...	...	2 0 0
Topping—4 men at 6 annas each	...	...	...	1 8 0
First suckering—6 women at 4 annas each	...	...	...	1 8 0
Second " 8 " "	...	...	...	2 0 0
Third " 6 " "	...	...	...	1 8 0
Harvest—6 men at 6 annas each	...	...	...	2 4 0
Curing, grading etc. at Rs. 2 per <i>putti</i> for $1\frac{1}{2}$ <i>putties</i>	...	...	...	3 0 0
Cost of curing shed (thatched shed) Rs. 15 less half the value realised on sale after use	...	...	...	7 8 0
Assessment or auction value (average)	...	...	...	20 0 0
Total cost of cultivation per acre	...	...	...	85 8 0
Rent of land (if the cultivator is a tenant)	...	...	...	250 0 0
Gross value realised by sale of the produce	497 0 0
Net gain per acre	161 8 0

Mango Nursery Practices in the West Coast.

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Introduction. To meet the growing demand for fruit plants of dependable quality, a Government fruit nursery was added to the Agricultural Research Station, Taliparamba in 1938. Mango nursery practices predominate the activities of this nursery. After a survey of the leading orchards of Malabar and South Kanara districts a number of scion plantations were selected in suitable centres where mango inarching is being done on a fairly large scale for the past three years. As a result of the experience gained in this work a few observations on certain nursery practices suited to the West Coast, as well as other useful data regarding the production of mango grafts are given in this note.

Raising of Seedling Rootstocks. Ripe mango fruits from early and heavy bearing trees of seedling races are collected during May—June. Of the seedling types used for seed propagation "Puliyan", "Bappakaya", "Kurukkan" and "Olor" are the outstanding varieties. Stones from ripe fruits, after rejection of light seeds, are immediately sown in seed beds one foot apart with the plumule end up. Sowing the mango stones with plumule up produces a straight taproot and stem, both of which characters facilitate inarching" (K. C. Naik, 1941).

Sen and Mallick (1940) have mentioned that mango seeds cannot be stored under ordinary conditions and that for successful germination the stone should be sown soon after its removal from the ripe fruit. Germination observations on over 700,000 mango stones have shown that only about a fourth of the total germinate within two months after sowing and the later germinations lack in vigour and consequently have to be rejected as unfit for stock purposes. The progress of germination of two of the commonest seedling varieties are given below :—

TABLE I

Variety.	Total no. of seeds sown.	Date of sowing.	Weekly progress of germination after sowing						Percentage germination in 9 weeks after sowing.
			4th week	5th week	6th week	7th week	8th week	9th week	
Puliyan	3800	19/20-5-39	104	325	698	825	918	957	25.2
Bappakaya	3100	20-5-39	461	545	655	669	679	685	21.1

During germination studies it was also observed that heavy seeds which sank in water gave convincingly higher germination percentage than light ones which floated or did not readily sink in water. Table II gives the details of germination.

TABLE II

Variety.	Nature of seed.	No. sown.	Date of sowing.	Percentage germination.
Bappakaya	Heavy	1000	23-5-39	22.9
Do.	Light	1000	Do.	13.1

Potting. Within two to three months after germination some of the earlier germinated seedlings show remarkable growth and these are sometimes lifted for potting if the object is to produce grafts within a year after sowing stones.

The following summary of operations will make this clear.

May—June	Sow mango stones.
September—October.	Pot very vigorous growing seedlings.
November	Graft to scion branches.
December	Give first cut.
January	Give second cut.
February	Separate graft from scion parents.
March—April	Keep for hardening.
May—June	Grafts are ready for distribution.

But generally mango seedlings are uprooted and potted only during the next South West monsoon, when they are about a year old.

At Taliparamba and other nursery centres in the West Coast hill grass or bamboo tubes are preferred to mud pot for potting. Both these materials are efficient and also cheap, if the grafts are not again repotted in mud pots before distribution. Hill grass potting is cheaper than bamboo and all the stock plants which are grafted early during the monsoon are invariably potted with this material. During summer the hill grass not only becomes brittle but moisture inside dries quicker and consequently bamboo tubes are preferred for potting. About 2,000 seedlings can be potted with about three rupees worth of hill grass though with the same amount bamboo tubes for potting 300 seedlings or mud pots for potting 150 seedlings only can be purchased. One disadvantage with hill grass potting is that it has to be renewed when kept exposed for more than a season. Potting is easier and more successful during the monsoon period when

seedlings can be lifted with naked roots and potted. A boy cooly can pot about hundred seedlings in a day in bamboo tubes and about fifty, if the material is hill grass. Casualties during potting vary from 10 to 25 per cent more under trying hot weather conditions. With timely and proper defoliation a few days previous to uprooting the seedlings and a little more care, potting is being successfully done even during the hot weather period so as to make a good number of seedlings available for grafting early during the monsoon with the idea of minimising the watering charges of grafts on parent trees.

Inarching. About one month after potting when the seedlings have established well within the pot space, they are taken up for grafting. From date of inarching to date of separation, a period of three months is found to be quite sufficient for the graft mango varieties growing in the West Coast. If inarching is taken up during June—July it is possible to dispense with the watering of grafts on mother trees and thereby reduce the cost of production of graft appreciably.

The table given below indicates that it is possible to take up inarching operations on a fairly successful scale during May to December. Due to the unfavourable hot weather conditions this work was not attempted during February to April. The figures relate to only one rootstock variety.

TABLE III

Months during which grafting was done.	1939—40.			1940—41.		
	No. grafted.	No. separated.	Percentage take.	No. grafted.	No. separated.	Percentage take.
May	...	...	...	135	118	87.4
June	325	258	79.4	1660	1416	85.3
July	691	540	78.2	934	635	68.0
August	437	403	92.2	449	343	76.4
September	470	415	88.3	362	330	91.2
October	1252	1157	92.4	532	395	74.3
November	925	823	88.9	639	591	92.5
December	1474	1094	74.3	305	227	74.4
January	336	232	63.4	130	74	56.9

Nursing of Grafts after Separation. After separation from the scion parent the grafts are kept for hardening under shade in a cool place in summer or under thatched shed with sides open in the monsoon period. The grafts separated during the earlier half of the South-West monsoon become ready for distribution during the latter half after keeping for hardening for about a month or more. Due to the humid and cool weather conditions prevailing at this period the casualties in hardening beds are much less than in summer months. The sales of mango grafts commence from the end of May and continue till the end of October, depending upon the planting season. All the grafts which are separated from October onwards have to be nursed till next June when only the main planting season commences. To successfully tide over this fairly long

period of rainless weather the grafts are de-potted and planted temporarily in a rich and cool place commanding easy irrigation facilities. After planting it is necessary to shade the graft for about a month. The casualties in the hardening beds vary from five to as much as thirty per cent, the higher death rates being mainly due to the adverse seasonal conditions. The grafts, thus planted, put on better growth flush than those growing in pots. These are re-potted in the beginning of the South West monsoon so as to be available for distribution during June-July.

Cost of Production of Grafts. The distance of the scion plantation from the nursery site and the season during which inarching is done are two of the important factors affecting the cost of production of grafts. In all commercial nursery enterprises, therefore, great attention is paid to reduce the transport charges of stock plants and grafts on parent trees. The average cost of production of grafts at the Agricultural Research Station, Taliparamba, and at any one of the scion plantations in Chirakkal Taluk, all situated within twenty miles from Taliparamba, are detailed below.

Cost of Production of Grafts.

Particulars of Expenditure.	A. R. S. Tali- paramba.	Centres in Chirakkal Taluk (average of 5 gardeners).
Total number grafted	1095	2285
Number of good grafts available for sale after casualties in hardening beds.	700	1250
1. Cost of potted stock plants @ Rs. 5 per 100 ...	54 12 0	114 4 0
2. Transport charges of stock plants to scion plantation ... ..	...	18 0 0
3. Cost of grafting materials	8 4 0	19 0 0
4. Wages of coolies for grafting, giving cuts and for separation of grafts	21 8 0	65 11 0
5. Watering charges of grafts on parent trees ...	38 0 0	29 7 0
6. Transport charges of grafts back to farm ...	...	18 0 0
7. Scion value @ 0-1-0 per successful graft ...	54 0 0	121 14 0
8. Cost of mud pots and potting charges ...	30 0 0	57 8 0
9. Proportionate watering charges in hardening beds till required for distribution ...	10 0 0	18 0 0
	216 8 0	461 12 0
Average cost of production of a graft ...	0 5 0	0 5 11

Summary. 1. The various seasonal operations from mango seed to graft as adopted at the Taliparamba Fruit Nursery, viz., collection and sowing of stones, germination observations on two of the important seedling types of Malabar, raising of seedling root-stocks, potting, inarching and care of grafts after separation have been briefly dealt with in this note.

2. The use of hill grass and bamboo tubes as cheap and efficient potting materials has been mentioned as a common nursery practice in this tract.

3. Results of mango inarching on a bulk scale during different months for two consecutive years have been furnished to indicate the possibility under West Coast conditions of the scope for bulk production of grafts during the major part of a year.

4. Figures for the cost of production of grafts at the Agricultural Research Station, Taliparamba, and the average figure for a few nearby centres are also given.

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SELECTED ARTICLE

The Search for Economic Plants

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The search for plants yielding spices and the history of their cultivation and use, as well as the story of the transport of the spices, is a romance which includes accounts of geographical discovery, monopolies, economic warfare, annexations of territories, and all the vices of theft, envy, hatred and malice, and all uncharitableness enumerated by the Apostle St. Paul.

Perhaps the spice which should be put in the forefront is pepper (*Piper nigrum*), native of Malabar and of the forests of Travancore, a spice now too seldom seen or appreciated in its natural conditions as black pepper corns, which was the staple article of trade between Europe and India for many ages. Most people to-day use white pepper, which is the small berry-like fruit or peppercorn, ground after its pericarp has been removed, thus depriving it of some of its pungency and best seasoning qualities.

Pepper was well known to Theophrastus in the fourth century, B. C., and to Dioscorides and Pliny, the former stating it to be a product of India. Its export from Barake on the Malabar coast, near Calicut is recorded in A. D. 64, and black pepper is one of the spices on which the Romans levied duty at Alexandria about A. D. 176. The first particulars, we have, that it was a climbing plant "sticking close to high trees like a vine" occur in the writings of Cosmas Indicopleustes, a merchant and later a monk, who wrote about A. D. 540.

The wealth of Venice and Genoa largely depended on this spice for tribute was levied on pepper, when money was scarce; it was often enacted that rents should be paid partly in pepper, and the Easterlings, according to the Statutes of Ethelred (A. D. 978—1016), coming in their ships to Billingsgate, had to pay at Christmas and Easter for the privilege of trading with London, a small tribute of cloth, five pairs of gloves, ten pounds of pepper and two barrels of vinegar. Now the only survival of this practice is the 'peppercorn rent', which signifies a merely nominal payment. The merchants who trafficked in spices in England were known as pepperers, and existed as a guild in the reign of Henry II and later were incorporated in the Grocers' Company.

Pepper, gums, myrrh, frankincense and cardamoms reached Europe mainly either by the Persian Gulf through Mesopotamia and Syria to the Levant or by the Red Sea and the Gulf of Suez and thence overland to Alexandria, while some