HARVEST AND POST HARVEST TECHNOLOGY OF COCONUT AND CACAO

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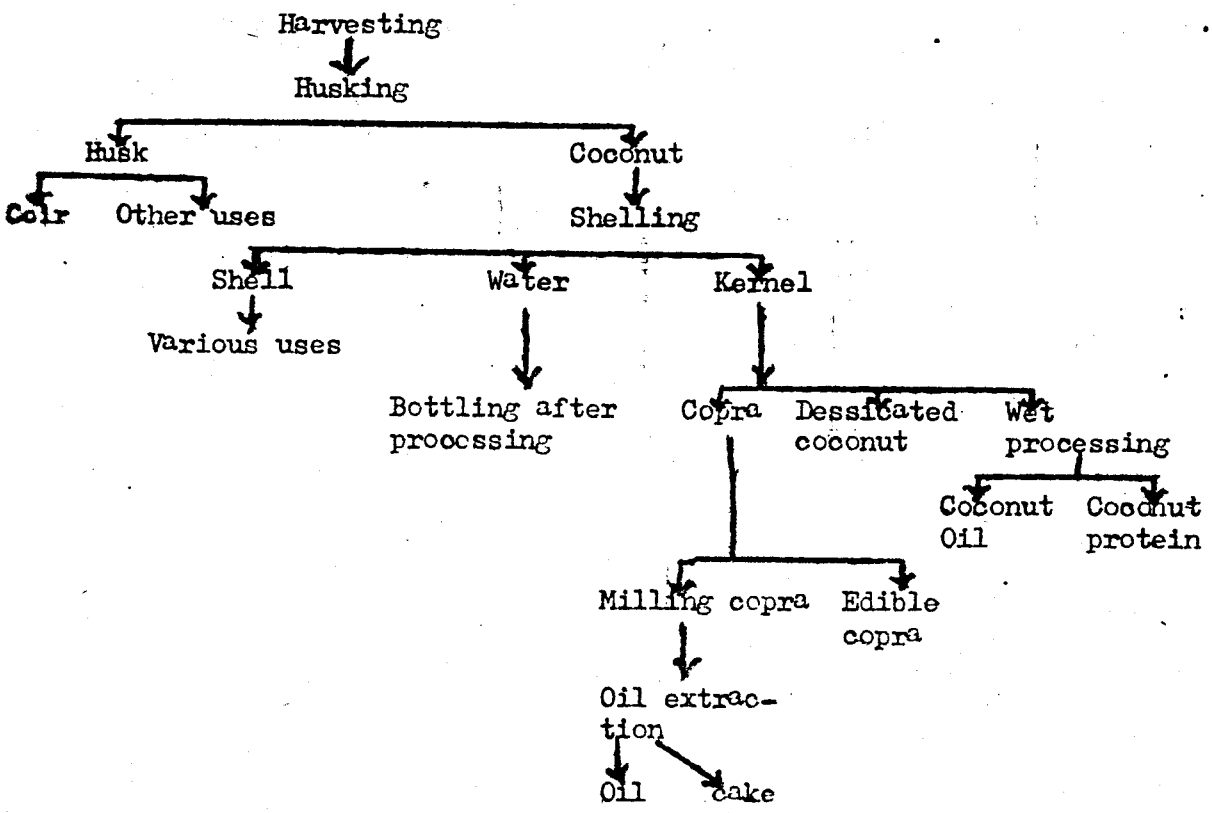
COCONUT

1. Introduction:

The coconut palm, cocos nucifera Linn is known as Kalpa Vriksha (or Tree of heaven) since each and every part of the palm is useful in one way or other. Coconut is one of the major agricultural plantation crops providing income and employment to rural people in the southern states of our country. The harvest and post harvest practices determine the quality of the end product and bye-product which directly influence the economy of the producer. Of late considerable efforts are being put in for improving the age old practices of harvest and post harvest operations.

2. Coconut processing:

The flow diagram of coconut processing is given below:



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3. Harvesting:

In India harvesting is commonly done by experienced climbers. It is a job of skill and experience. Now a days climbers are rare and their wages are also very high. A mechanical device for climbing the palms has been a long felt need and many attempts were made. The climing device developed by Mr.Joseph, a farmer from Chemberi, Kerala is becoming popular although it needs improvements on ease of operation and safety of the climbers. Harvesting can also be done on plams which are not much taller, with the help of a knife attached to a long bamboo pole.

Storage and seasoning: After the harvest, the usual practice is to store the nuts in heaps under shade. This type of storing is also known as seasoning.

4. Husking:

The husk is generally removed manually with the aid of a spike fixed on the ground. This is a specialised job and requires skilled labourers. Attempts were made to develop a husking device with which any unskilled person can do the husking. The coconut dehusker (1) developed by CPCRI can be operated by any unskilled person. The out turn of this dehusker is 105-120 nuts per hour. Its cost is about Rs.1200/- only. This device is economically usable for a farmer having 5 ha. of coconut garden or for medium processing units.

After dehusking the cocoonut, we get husk and kernel with shell. The most important commercial utilisation of husk is for the manufacture of coconut coir. Husks are also utilized as fuel, as a surface and seedling pit mulch and also for hurrying in the coconut gardens. Pith, the waste product obtained during the extraction of the coir fibre from retted, partially retted or unretted husk, constitutes 70% of the husk itself. It has a limited use as a furface mulch for top soils. Research is going on nowadays to use coconut pith in building blocks, and in the manufacture of commercial products such as cardboards insulators etc.

5. Copra drying:

Fresh coconut kernel which has 45-55% moisture content (m.c) has to be dried to below 6% m.c. for oil extraction. Drying determines the quality of copra and ultimately coconut oil. Copra may be made either by sundrying or by using different types of dryers. During rainy season or with restricted sunshine, drying by artificial method is the only solution for processing plantation crop products. The direct type Kiln dryers are not desirable for copra as the product become inferior in quality due to smoking and improper drying. Hence the solar cabinet dryer, electrical dryers and the small holders dryer using agricultural waste as fuel are developed by CPCRI for copra drying. The particulars of these dryers are given below:

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(i) Solar Cabinet dryer: This dryer is of chamber type having direct heating and natural air convection arrangements. The capacity of the dryer is 90-100 nuts per batch. The drying time taken is 3½ to 4 days thereby reducing the time by 50% as compared to the conventional method. The temperature and the relative humidity inside the dryer was found 17°C more and 22% less respectively, compared to the respective ambient factors. The dryer costs about Rs.2,200/- and the cost of drying is 85 paise per kg.

(ii) Electrical dryer: It is a tray type dryer with mixed flow and forced hot air circulation designed for drying 1000 coconuts (160 kg. of copra). This can be used to dry other crops like cardamom, pepper, etc. by changing the weld mesh trays to wiremesh trays of suitable size. The dryer may cost approximately Rs.8,000/- and so is feasible to cooperatives and copra processing units.

(iii) Small holder's dryer for plantation crops using agricultural waste as fuel: This dryer is of 'Batch type' having indirect heating and natural air convection arrangements. Four hundred nuts per batch can be dried in this dryer in a time of 36 hrs. It is a multipurpose dryer and so other crops like cocoa and arecanut can also be dried in this. The cost of drying/kg of copra, cocoa and ripe arecanut is 75 paise, 1 Re. and 1 rupee 05 paise respectively. Similar type of dryers of 1000 coconut/batch capacity was also developed at CPCRI.

(iv) 5000 nuts/batch capacity dryer: This consists of two side brick masonry walls. The front and back side of the dryer is covered with cement asbestos sheet. For loading the coconut cups a wire mesh platform is provided which is supported by MS channels and flats. A circular MS drum is used as fuel burning cum heat exchanger unit. Two flue pipes are attached at one end to get more efficient heat utilisation and uniform temperature distribution. Two smoke pipes are attached with these flue pipes.

Specification of the dryer: 1. Capacity: 3000 to 4500 coconuts/batch

2. Drying time: 4 days (34 to 36 hours)

Ball copra: Ball copra is of superfine quality and command a premium price in the market. It is prepared by storing fully matured nuts for 10 to 12 months when kernel will get detached from the shell. Research is in progress at CPCRI to prepare ball copra in a shorter time by giving different treatments.

5. Copra Moisture Meter:

In milling establishments the moisture determination is done by experienced people who by breaking a piece of copra, assess the moisture content on the basis of the depth and colour of the moisture lining in the exposed surface. To estimate the moisture content in a scientific and accurate way,

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Harvesting:

Generally cocoa gives two main crops in a year, September-January and April-June, though off-season crops may be seen almost all through the year. Only ripe pods have to be harvested without damaging the flower cushions. When the colour of the pod's groove become yellow or orange yellow colour, then it has to be harvested. Both under mature and over mature pods will not give good chocolate flavour. The pods should be harvested by cutting the stalk with the help of a knife. The damaged unripe and infected pods have to be separated out to ensure better quality of beans after processing. The harvested pods should be kept for 2 to 4 days before opening for fermentation but it should not be kept beyond 4 days.

Breaking the pods:

For breaking the pods wooden billet may be used or hitting the pods against hard surfaces may be resorted to.

Fermentation:

Chocolate flavour is developed by the two processes of fermentation at producers level and roasting of them by the manufacturers. In brief fermentation involves keeping a mass of cocoa beans well insulated so that heat is retained while allowing air to pass through it. Sufficient air should pass through so that the carbon dioxide surrounding the beans must be removed. The sweat liquid from mass should drain out.

Important requirement for proper fermentation:

1. Beans must have attained proper maturity
2. Germination of beans must not take place.
3. The temperature inside the fermentation container should be about 50°C.
4. Carbondioxide and sweat liquid should be removed.

The different methods of fermentation are (i) Basket lined with banana leaf, (ii) Box method, (iii) Tray method.

In all methods, on first day of fermentation, more facility has to be provided for draining the sweat water. On second day, beans should be mixed well and then put in the insulated container to maintain the temperature at about 50°C. On third and fifth day also do similarly. Under normal condition the beans can be taken out for drying at the end of the sixth day. Over fermentation which is more harmful than underfermentation.

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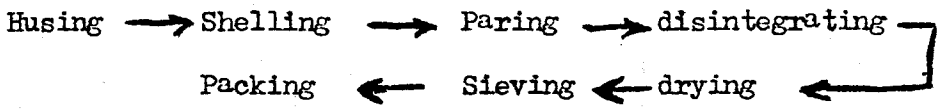
the CPCRI has developed a moisture meter which works on the principle of electric conductivity. It can read the moisture content from 40% to 5 % so that the moisture can be found out at different stages of drying.

After the initial calibration of the meter, the percentage of moisture in copra can be read directly by inserting its probe into the coconut kernel.

7. Desiccated coconut:

It is the dried out disintegrated coconut meat having demand all over the world in the confectionary and other food industries. The flow diagram of the preparation of desiccated coconut is shown below:



The disintegrated coconut meat is to be dried at a temperature of 77°C to 82°C to bring down the m.c. to 2-2.5%. The CPCRI electrical dryer is suitable for this purpose.

8. Partially defatted coconut gratings:

The Regional Research Laboratory, Trivandrum has developed a technology by which partially defatted coconut grating can be produced for food use after part of the oil is recovered. The oil thus recovered is of superior quality 'water white' oil with fresh coconut aroma and very low F.F.A. This technology was released, through NRDC.

9. Bottling of coconut water:

Large quantity of coconut water is being wasted in the copra and desiccated coconut processing units in Kerala and Karnataka, because of poor storage quality. Due to the biochemical changes including flavour and taste during maturation, the mature coconut water is not as palatable as tender coconut water. The Regional Research Laboratory, Trivandrum has developed techniques to up grade the mature coconut water to a product very close to tender coconut water in taste, flavour, etc. and to bottle it to preserve it for 45 to 60 days. This technology was also released through NRDC.

10. Coconut shell:

The coconut shells are mainly used as fuel and to some extent in the manufacture of activated carbon. It has been reported (Balgopal & Menon 1987) that coconut shell can be used as a building material in cellular building blocks for load bearing and partition wall construction and in sandwich/for wallcum roof construction.

Judging the end point of fermentation:

The following checks may be made:

1. Portion of pulp adhering to the beans should be red brown as against original dull white.

2. The sweat liquid coming out should be reddish brown.

3. Fermented beans when cut, the colour inside should be brown and the out half of the beans when bent should reveal irregular cracks on the cut surface.

Drying:

At the end of fermentation, the beans should be dried by sun drying or artificial drying to bring down the moisture content of beans from 50 to 55% to 6-7% for safe storage.

Artificial drying:

Depending upon the quantity of beans, many dryer were developed by using electric heater as source of heat. All these dryers are tray type. The duration of artificial drying varies from 48-96 hours. The drying of beans at high temperature should be avoided as it results in low quality end product.

Storage of beans:

The dried beans after cooling to room temperature should be cleaned and packed in polythene lines gunny bags. The bags are kept on a raised platform made of wooden planks.

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