

# RECENT DEVELOPMENTS IN THE HARVEST AND POST-HARVEST TECHNOLOGY OF COCONUT

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**Abstract:** The harvest and post-harvest practices, in general, determine the quality of the end product. Husking, drying and oil extraction are the major post-harvest operations in the dry processing of coconut. Wet processing, though costly, can be adopted for the preparation of a variety of food items like spray dried coconut milk, white soluble protein powder etc. The CPCRI machineries/devices like coconut dehusker, dryers and copra moisture meter are much useful to farmers and copra processors. The multipurpose dryer using agricultural waste as fuel developed by CPCRI has made possible to dry coconuts economically during rainy season also. The CPCRI copra moisture meter can estimate the moisture content from 40 per cent to 5 per cent so that the moisture content at different stages of drying can be found out. The technology developed by RRL, Trivandrum for bottling and preservation of coconut water and for preparation of partially defatted coconut gratings is another step in coconut processing. Commercial utilization of coconut shell in building construction as a primary structural material or as a filler material and coconut pith in the manufacture of hard boards, insulators, etc. could convert these waste materials into useful products.

## INTRODUCTION

The harvest and post-harvest practices determine the quality of the end product and byproduct of coconut which directly influence the economy of the producer. Of late, considerable efforts are being put in for improving the age old practices in harvest and post-harvest processes and to develop new technology, thus obtaining valuable byproducts from waste material.

## HARVESTING

In India, harvesting is commonly done by experienced climbers. It is a job of skill and experience. Nowadays climbers are rare and their wages are also very high. A mechanical device for climbing the palm has been a long felt need and many attempts were made. The climbing device developed by 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 palms which are not much taller

with the help of a knife attached to a long bamboo pole. After the harvest, the usual practice is to store the nuts in heaps under shade. This type of storing is also known as seasoning.

## 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 developed by CPCRI can be operated by any unskilled person (Anon., 1985). The out-turn of this husker is 105-120 nuts per hour. Its cost is about Rs 1200 only. This device is economically viable for a farmer having 5 ha of coconut garden or for medium processing units.

The most important commercial utilization of husk is for the manufacture of coconut coir. Husks are also utilized as fuel, seedling pit mulch and soil

moisture absorbent in coconut gardens. Pith, the waste product obtained during the extraction of coir fibre from retted, partially retted or unretted husk, constitutes 70% of the husk. It has a limited use as a surface mulch of top soils. Research is in progress to use coconut pith in building blocks, and for the manufacture of commercial products such as hard boards, insulators, etc.

### COPRA DRYING

Fresh coconut kernel which has 45-55% moisture has to be dried to a moisture level of less than 6% for oil extraction. Drying determines the quality of copra and ultimately coconut oil. Copra may be made both in the form of cups and balls. Cup copra can 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 becomes 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 were developed by CPCRI, for copra drying.

#### (1) *Solar cabinet dryer*

This dryer is of chamber type (Patil, 1982a) having direct heating and natural air convection arrangements. The capacity of the dryer is 90-100 nuts per batch. The drying time is 3.5 to 4 days thereby reducing the time by 50% as compared to the conventional method. The temperature and the relative humidity inside the dryer were found to be 17°C more and 22% less respectively, compared to the respective ambient factors. The dryer costs about Rs 2200 and the cost of drying is 85 paise per kg.

#### (2) *Electrical dryer*

It is a tray type dryer with mixed flow and forced hot air circulation designed (Patil and Singh, 1984) 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 8000 and so is feasible to co-operatives and copra processing units.

#### (3) *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 (Patil, 1982b). Four hundred nuts per batch can be dried in this dryer in 36 hours. It is a multipurpose dryer and so other crops like cocoa and arecanut can also be dried in this. The cost of drying per kg of copra and cocoa is Rs 0.75 and Rs 1 respectively. Similar types of dryers of 1000 coconuts/batch and 3000 coconuts/batch capacity were also developed at CPCRI.

### BALL COPRA

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

### 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 nature and

colour of the exposed surface. To estimate the moisture content in a scientific and accurate way, the CPCRI has developed a moisture meter which works on the principle of electrical conductivity. It can read 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 (Madhavan, 1986).

### WET PROCESSING

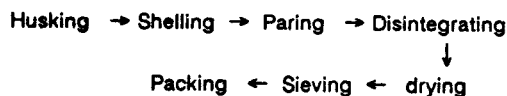
Wet processing comprises (1) aqueous processing and (2) preparation of desiccated coconut.

#### Aqueous processing

The advantage of aqueous process is that the protein present in coconut is not lost in the cake. The suitability of this processing method for India requires in-depth study as it will release the existing dry milling rotaries and expellers.

#### Desiccated coconut

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



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

### 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 a part of the oil is recovered. The oil thus recovered is of superior quality ('water white') with fresh coconut aroma and very low FFA (Satyavathi, 1987). This technology was released through NRDC.

### 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 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 upgrade the mature coconut water to a product, very close to tender coconut water in taste and flavour and to bottle and preserve it for 45 to 60 days. This technology was also released through NRDC (Satyavathi, 1987).

### COCONUT SHELL

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

### CONCLUSION

The post-harvest processing of coconut is mainly confined to copra

making for edible oil milling purposes and for coir processing. For diversification of its uses entrepreneurs are to be encouraged to start industries for the commercial utilization of coconut products and byproducts. The farmers and the processors have not fully accepted the modern technologies either due to its high cost or due to their lethargy to go away from conventional ways. Research should be activated to modify certain labour oriented operations. For example, coconut dehusker and a mechanical palm climbing device are long felt needs. A small scale simple oil mill for house-hold may also have to be developed. Above all, the achievements in the field of research should reach the farmers and they must be able to adopt it.

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