

# COPRA MANUFACTURE AND HOW TO REDUCE OFF-GRADES

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## RÉSUMÉ OF PAPER\*

The term dehydration when applied to foods may be defined as the process of removal of surplus water without destruction of cellular tissues or impairment of their energy values.

In processing the kernel (endosperm) of the coconut for the production of copra, an important point to remember is that some of its constituent food factors are not only soluble in water, but are also liable to decomposition with consequent impairment of biological value. Even though copra manufacture is a straightforward process of dehydration, it is common experience that faulty processing in ill-designed driers could very well produce scorching and stewing effects with consequent loss of quality. Any processing technique for the manufacture of copra may be considered to be truly efficient, only when the dehydration of the kernel is accomplished satisfactorily without the food value or flavour characteristics of the meat being in any way destroyed or impaired.

The drying procedures and systems that are in vogue for the preparation of copra may be grouped broadly into the following three categories:—

- i. Sun-drying
- ii. Smoke-drying or curing over an open fire in direct driers or kilns
- iii. Indirect drying, by means of artificial heat, either on a heated platform or in an enclosed chamber heated by flues.

**Sun-drying.**—Sun-drying is the oldest and easiest, but slowest method of copra manufacture. The process as well as the applied equipment is very simple, and it is in fact possible to prepare copra of excellent quality by sun-drying alone. The principal disadvantage of sun-drying however, lies in its total dependence on the weather, which prevents working to a time-table throughout the year. Further, it is very impracticable and unwieldy on large holdings and plantations.

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**Smoke-drying.**—Unlike sun-drying, in the artificial method of smoke-drying, the curing operations are carried out over an open fire in direct driers or kilns. The general procedure in this type of kiln, would be to heat the kernel directly by means of the smoke and hot combustion gases of the fuel. Depending on the efficiency of the drier and the type of fuel used, the copra produced could be of extremely variable quality. In the less efficient types, the result is usually a very inferior and heavily smoked product.

It can be said, that without exception, the smoke-drying of copra is a practice that would characterise almost all the coconut growing countries of the world. At the present time, a very wide range of direct-fired smoke-kilns like the 'Pagsanjan', 'Sariaya' and 'Tayabas' type tapahans (smoke-driers) of the Philippines, the Cooke type — 'Smallholders', '10 acre' and '30 acre' kilns of Malaya, the Indian version of the Cooke kiln, 'Jack's Pill Boxes' of Fiji, the IST-Nacoco (De Vapor) Drier also of the Philippines — designed by the Institute of Science and Technology in Manila, the Charcoal-Fired Oven and of course the Standard Ceylon Kiln, are in use.

**Indirect Drying using Hot-Air Driers.**—The main disadvantages of drying over open fires are the comparative slowness of the process and the risk of sooty deposits on the finished copra. Even in the standard Ceylon Drier, where smoke is reduced to a minimum, it takes 96 hours, including cooling periods, to bring the moisture content of the kernels down to 6%. In hot air driers, on the otherhand, which are so designed as to prevent the combustion gases or the smoke of the applied fuel from coming into contact with the kernels, drying, which is continuous with no intervals for cooling, is said to be complete in no more than 24 to 40 hours, the length of time depending on the type of drier.

Like smoke-driers, a whole range of hot-air driers have been designed (and patented) and are being used in different coconut growing countries at the present time. Whilst the majority of them are (horizontal or vertical) natural draught driers, some of them are appropriately adapted for operation with forced draught employing power driven fans. Since hot-air driers are designed for more or less continuous operation, optimum efficiency is as a rule obtained with most of them, only when cut-kernels, rather than half-nuts in the shell, are processed.

The "Chula" Drier and the Pearson's Patent Copra Kiln are the only two types of hot-air drier, that have been in use on some of the estates in Ceylon.

**The Standard Ceylon Kiln.**—The Standard Ceylon Kiln is essentially a smoke-drier. It is a simple structure that does not involve expensive fabrication, and consists principally of a fire-pit, a copra grill or platform, a corrugated iron roof fitted with a jack roof, and a covered working verandah. There is also the barbecue which must always be regarded as part and parcel of the copra kiln. The Ceylon kiln has well known merits, being easily adaptable for use on large plantations as well as small village holdings. The drying procedure embodies adequate safeguards to minimise the production of inferior copra. The curing process actually takes about five days with about eight to nine firings. It is generally possible to remove the shells on the third day after the fourth fire.

In a correctly managed Standard Ceylon Drier, the percentage of under-dried halves left over after the eighth firing on the fifth day will be about 10%, but higher if the drier design is non-standard or the drying procedure incorrectly followed. It can be said that there should be no difficulty in producing fairly uniform high grade copra with the Ceylon kiln, provided the standard operational procedure is rigidly adhered to.

#### **FACTORS INFLUENCING PRODUCTION OF OFF-GRADES**

Apart from the efficiency of the equipment used for the dehydration of the kernel, and the skill of the curers, it is generally believed that the factors influencing the proportion of the inferior grades are droughts, which lead to immature nutfall, wet weather during curing and delay in curing leading to increased germinations. Actually the factors that would detract from quality and influence the production of off-grades are far more numerous, and could conveniently be categorised under the four broad headings:—

- (1) Maturity of the Drupe
- (2) Method of Pretreatment
- (3) Dehydration Procedure and
- (4) Precision of Kiln Design.

The results of certain experiments carried out by the author have clearly demonstrated that the practice of "seasoning" coconuts — i.e. storing them in the field for 3-4 weeks prior to conversion into copra, is decidedly beneficial, as it affects all-round improvement in the quality of copra produced. The conclusion has been drawn that where a mixed crop is harvested, it is essential to separate the *mature* green nuts (First and Second bunch) from the brown or dead ripe nuts. Whilst the former should be seasoned for a month, the latter should be converted into copra straightaway without storage. The harvesting of *immature* green nuts ("Kalati"—usually from the 3rd bunch) must be prevented by careful

supervision. Copra from immature nuts is generally spongy, springy, leathery and wrinkled so that it is difficult to crush. It also gives an undesirable expeller cake of high oil content. Immature kernels, resist drying and remain under-dried and case-hardened even after the 'conditioning fire' that is given to all under-dried copra sorted out at the end of each shift in Ceylon-driers. Copra from immature nuts, which is classified in Ceylon as third quality, is unfit for export and should not occur under good estate management.

An endeavour has been made to bring within the compass of the paper a certain amount of information relating to the technological aspects of copra manufacture, and dovetail them with those factors associated with the different aspects of processing, that would conduce towards the production of quality copra.

The Standard Ceylon Kiln has been fully described, and it has been carefully shown that a good kiln by itself would be inadequate for the production of high grade copra. In fact, there are many other factors associated with the raw material itself, its method of pretreatment and the drying procedure that have to be carefully observed if the final product is to be of uniform high quality. The various factors involved, and their respective effects, have been carefully elucidated, to enable a better understanding of all the conditions that should be observed in dehydrating the kernel, if the ultimate goal of making quality copra is to be achieved.