MORE FACILITIES FOR SRI LANKA'S COCONUT RESEARCH INSTITUTE

Coconut Development Authority (Sri Lanka) has launched a scheme to improve the infrastructural facilities at the Coconut Research Institute Campus with financial aid provided by the Asian Development Bank(ADB) & the International Fund for Agricultural Development (IFAD).

This scheme includes construction of 54 houses for various grades of Staff, improving electricity and telecommunication facilities, water services & a Training Centre for coconut extension workers.

Prof.B.A.Abeywickrama (left) Chairman,Coconut Research Board receiving the Hon. Minister of Coconut Industries at the Institute premises for the foundation laying ceremony.

Hon. Minister of Coconut Industries Mr. Harold Herat laying the foundation stone for the Housing Scheme.

FEATURE ARTICLES

COPRA DRYING WITH SOLAR ENERGY

BY

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INTRODUCTION

Copra is the dried coconut meat obtained from the coconut *(Cocos nucifera L.)* fresh coconut meat contains 45 to 50 per cent moisture (wet basis) and it has to be reduced to 6% for safe storage and for further processing. Annual production of coconut in India is about 5830 million nuts from 1.071 million ha area. Forty percent of the total production is converted into copra by drying. The coconuts are harvested every month except during monsoon as the trunk becomes slippery. About 68% of the total production has been reported to be harvested and processed during October to May (Table 1).

India, a tropical country is blessed with plentiful supply of bright sunlight. On the west coast the average intensity of solar radiation is about 440 cal/cm^2/day. The daily sunshine hours reported are about 8.5 during October to May. Availability of this free energy during this period makes open sun-drying of copra feasible with good quality.

PROCESS - Fully matured 12 months old coconuts (Fig.1) were picked up & stored for 4 to 6 weeks. After removing the husk, the nuts were cut into two halves & water was drained off. For complete removal of the adhering nut water, the cups were kept inverted for 15 min. The cups were then spread on the drying floors, in the low cost solar drier and in the cabinet drier.

During bright sunny days copra drying was completed within nine days on cement floor. It has been reported that the beginning of the drying process should start within 4 hours after nut splitting otherwise meat starts getting infested by micro-organisms. Prevailing of the inclement weather even for a day causes infestation of copra by different organisms as given in Table 2. Hence it was felt essential to develop a drying system using available solar energy more efficiently to achieve quicker drying with better quality of copra.

USE OF DIFFERENT DRYING FLOORS - At attempt was made to modify the existing practice of open sun drying with low cost technology. For this purpose the drying floor was substituted with locally available materials such as black painted palmyra mat and jute cloth which have high light absorption, high specific heat and high resistance to conductive heat transfer. These drying surfaces were supposed to create an effect of convective heat transfers to surrounding layers of air. The comparative study revealed that black painted palmyra mat reduces drying time by 20% effecting drying within 7 days compared to 8 and 9 days on jute cloth and cement floor, respectively (Table 3).

LOW COST POLYTHELENE COVERED DRIER - For efficient use of the convective heat transfer effect in surrounding layers of the air created by the black painted palmyra mat, a low cost solar drier using black painted palmyra mat as drying floor &double layer transparent polythelene sheet(200 gauge) on 10 mm diameter MS Rod frame was constructed. The top surface was inclined an angle of 27^{o} (Fig. 2). Perforations were provided on the polythelene cover for air circulation. The structure was kept stationary and facing South. The area of the drying surface was 12 ft^2. The transparency of the double layered polythelene sheet was found to be 85%. The temperature inside the drier was found average 8 to 10^{o} above the ambient temperature. The efficiency of the structure in terms of energy input as direct solar radiation was about 25%. A batch of 60 to 80 nuts could be dried within 5.5 days compared to 7 days on palmyra mats in open sun. The cost of the drier is about Rs.50/- and if the transparent cover is handled carefully can last for more than 2 seasons.

SOLAR CABINET DRIER FOR COPRA - The direct solar radiation at Kasaragod (12.5^{o} N, 75^{o}E and 10.7 MSL) on the flat surface in January was found to be 374 langleys/day (8.30 hr to 17.00 hr). The amount of solar energy received on the surface inclined at 12.5^{o} was found to be 425 l/day in stationary position facing South. The reception of the direct solar radiation increases to 460 l/day when the surface was continuously facing sun by means of suntracking arrangement. For efficient use of the available solar energy on rotating inclined surface a solar cabinet drier as shown in Fig. 3 was developed.

DESCRIPTION OF THE CABINET DRIER - The frame of the drier was made of locally available jackwood. The drying surface of 1 m^2 area was of 22 gauge corrugated GI sheet to get effective absorber area of 1.1m^2. Drying surface was inclined at an angle of 12.5^{o} & fitted on 3 mm thick wooden plant board with 2kg of coir fibre insulation in between. The drying chamber was made of 3mm window glass on sides and 3mm plastic sheet on the top to avoid the risk of breakage during handling. The height of the drying chamber was kept at 40 cm uniformly from inlet to exhaust end. Inlet & exhaust of 0.135m^2 area covered with wiremesh were provided for air circulation. Commercial grade aluminium foil of 24 gauge was used as reflectors on the three sides of the drier. The area of the reflector was 1.5m^2. Castor wheels were provided for manual sun tracking & movement of the drier to short distances. The average temperature rise in the cabinet during drying was recorded to be 17^{o}C. A batch of 80 to 100 coconuts depending upon the size (double the spreading density as compared to open drying) were accommodated in the drier with the cups facing up. The time required for drying was found to be $3\frac{1}{2}$ to 4 days. The air velocity over the material was found about 5m/min. Effeciency of the solar cabinet drier considering only direct solar radiation as energy input was found to be 50% for copra drying.

It was observed during experimentation that the capacity of drying per batch could be doubled on arranging the cups facing side for initial $1\frac{1}{2}$ days till the shells could be removed. The modification in drying process increased the drying time to $4\frac{1}{2}$ to 5 days from $3\frac{1}{2}$ to 4 days. The cost of such a cabinet drier works out to Rs.900/- & the operation cost estimated to be 15 to 20Ps/Kg. of dried copra.

CONCLUSIONS - The results summarised in table 3 show that black painted palmyra mat saves 20% drying time compared to conventional drying of copra on cement floor. The reduction in drying time was 20% & 50% at 60% & 100% more drying capacity/unit area compared to black painted palmyra mat by polythelene covered drier & solar cabinet drier respectively. The copra drie in the drier was found to be free from dirt, dust & with minimal microbial festation.

TABLE 1. ANNUAL COCONUT PRODUCTION PATTERN

Month		Production as % of the Total Production.	
October	...	5.6	
November	...	6.5	
December	...	6.0	
January	...	6.4	
February	...	7.7	
March	...	9.8	
April	...	14.1	
May	...	11.7	
June	...	9.8)	
July	...	8.2)	
August	...	7.7)	33.2
September	...	6.5)	

Source : Menon and Pandalai, 1960.

TABLE 2. MOISTURE CONTENT OF WHOLE CUPS AND SUCCESSION OF MICROFLORA

Temperature		Moisture	Micro-organisms
Maximum	Minimum	Content %	
--	--	51.2	Bacteria
30.5	21.3	28.4	*Serratia marcescens, Staphylococus aurens.*
31.5	21.3	20.3	*Rhizopus stolorifer, R. Oryzae, Cucor hienalis*
30.6	22.1	17.5	*Aspergillus niger, A. Flavur*
31.1	23.0	13.6	*A. Oryzae, A. Tamarii, A. Ochraceous, A. cheualieri*
31.1	21.2	10.8	*Botryodiplodia theobromae, Curvularia snegalensis*
32.2	19.9	7.5	*B. theobromae, C. Senegalensis*
30.0	20.8	5.0	*Penicillium Citrinum*

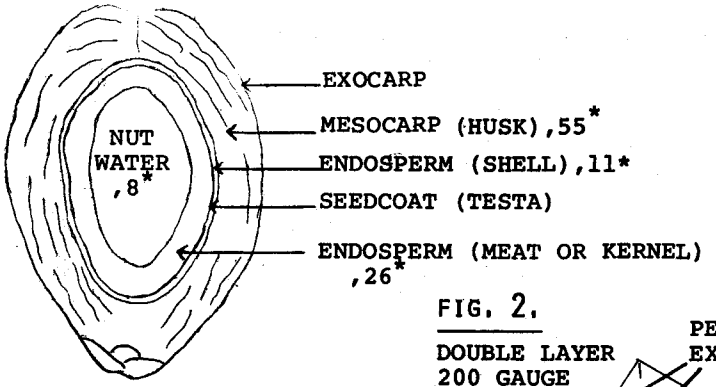
Source : Philips etal 1980.

TABLE 3. DRYING OF COPRA BY DIFFERENT METHODS

Sl. No.	Drying Method	Drying time in days	Spreading density Nuts/ m^2	Copra Production Kg/m^2 - day
1.	Cement floor (8)	9 (100)	40 (100)	0.71 (100)
2.	Jute Cloth (8)	8 (89)	40 (100)	0.80 (113)
3.	Black painted Palmyra Mat (8)	7 (78)	40 (100)	0.91 (128)
4.	Polythelene covered drier	5.5(61)	60 (150)	1.74 (245)
5.	Solar Cabinet drier	3.5(39)	80 (200)	3.66 (514)

Values given in parantheses are indices for comparison with conventional open drying method. (8)-reference.

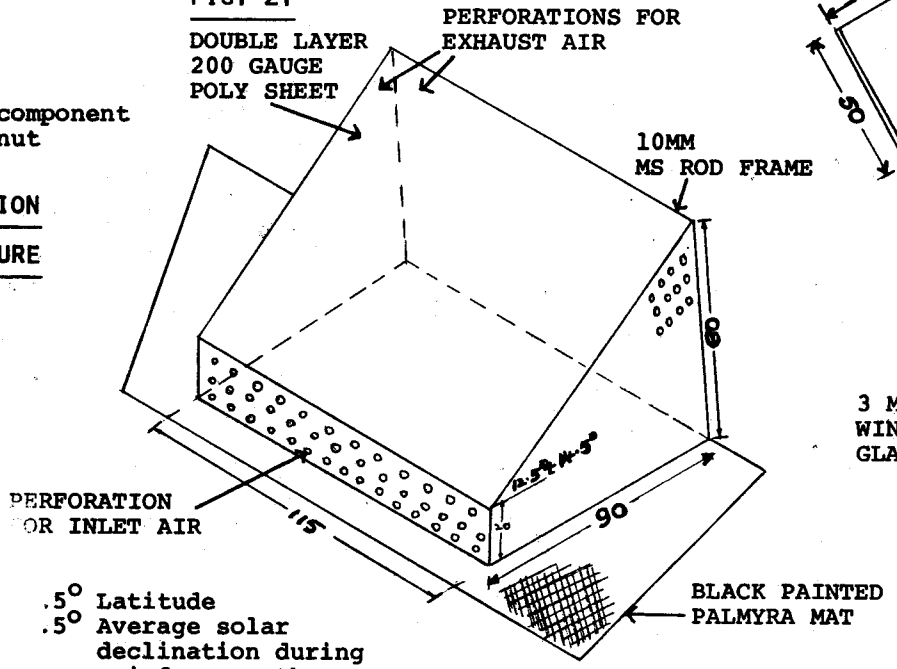
FIG. 1.



*Characteristic component as % of whole nut

LONGITUDINAL SECTION THROUGH A MATURE COCONUT

FIG. 2.

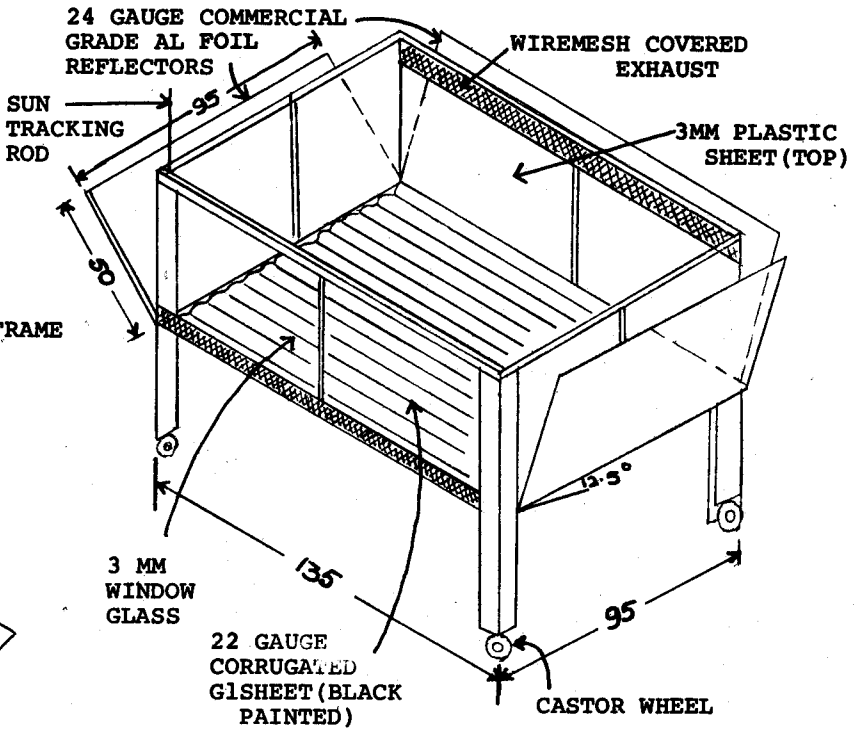


.5° Latitude
.5° Average solar declination during rainfree months

(ALL DIMENSION ARE IN CM)

LOW COST POLYTHELENE COVERED SOLAR DRIER FOR COPRA

FIG. 3.



(ALL DIMENSIONS ARE IN CM)

SOLAR CABINET DRIER FOR COPRA DRYING

COCONUT INFORMATION CENTRE ANNOUNCES

A NEW PUBLICATION PROGRAMME FROM THE CENTRE - It has been noted that many useful information from various symposia and seminar proceedings of National Organizations does not reach the potential users as they are not published.

The Centre proposes in future to collect these proceedings and publish abstracts in the Newsletter.

INFORMATION DISSEMINATION PROGRAMME (Coconut Information Centre) - Information dissemination is a major objective of the Centre. In achieving this objective the Centre has already published Annual Annotated Bibliographies covering world literature up to 1980, apart from the various Subject Bibliographies supplied on requests received and current awareness service in the Quarterly Newsletter.

Annual Annotated Bibliographical Series for the year 1981 will be available very shortly.

Another service in Information Dissemination field is offered by publishing Retrospective Bibliographies, on various subjects covering the period 1900-1965 on priority basis.

The first series under this programme is on Pests of Coconut. This Series with 1175 entries for all pests recorded will be out very shortly.

Please contact the Centre for further details.

SELECTIVE DISSEMINATION OF INFORMATION(SDI) SERVICE FOR INDIVIDUAL SCIENTISTS - The Centre attempts everyway possible to feed the Scientists with their information needs. SDI Service now being contemplated will serve many scientists in remote areas with limited resources available at their disposal to be more knowledgeable in their subject fields.

In order for the Centre to organise subject profiles to undertake this service please send your subject profile, specifically defining the subject area so that we can feed you with information in your field as such information is received at the Centre. We hope you wish to be up-to-date with your information.

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