CP 0730

'Do-it-yourself' type domestic solar dryer

Substitution of drying floor with black painted palmyra mat has been found to reduce copra drying time by 21%—a method which has been made use of in designing the do-it-yourself solar dryer.

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ON THE WEST coast of India the average intensity of solar radiation is 440 cal/m^2/day while the average sunshine hours are 8.5 during October to May. The use of this free energy for drying plantation crops like copra, black pepper and arecanut and other food products like chips is the most economical drying practice.

The average land holding of coconut growers is only 0.2 ha and 90% of the total land holdings are below one hectare. The small farmers dry their produce on the mud floor in the yard of their house. The substitution of drying floor with black painted palmyra mat was found to reduce copra drying time by 21%. The drying time can be further reduced by using 'do-it-yourself' type dryer developed by the author at the Central Plantation Crops Research Institute, Kasaragod, Kerala.

Design and construction

The main objectives of solar dryers are to (a) avoid direct contact with surrounding atmosphere and (b) conserve and effectively utilize the convective heating of the air due to solar energy received by the black surface.

The steps in the construction of this dryer are shown in Fig. 1. It consists of a black-painted palmyra mat, an MS rod/angle frame, a GI wire

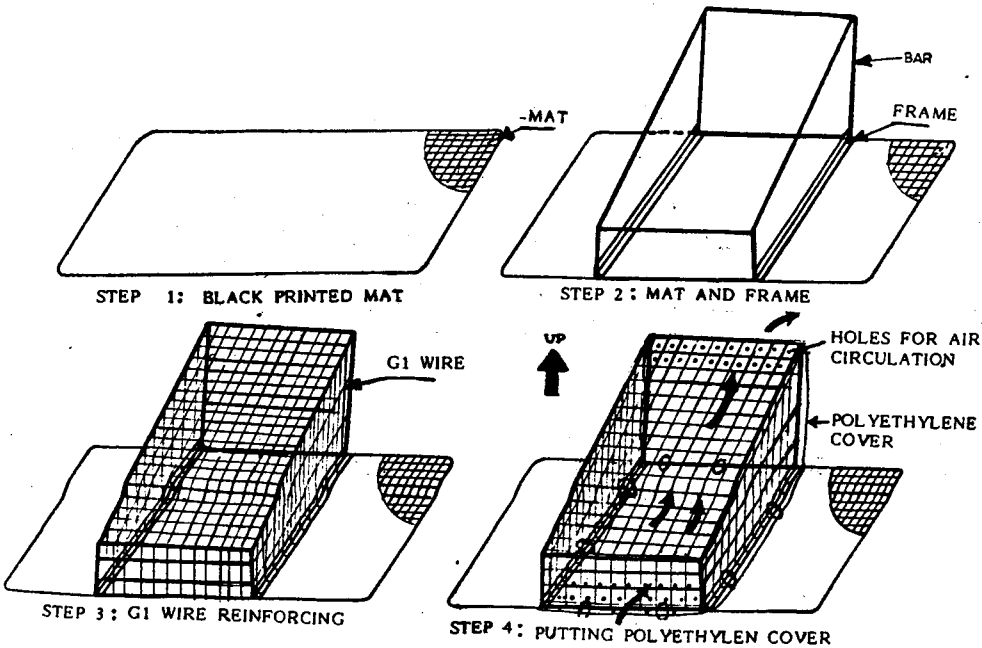

Table 1. Materials required for construction of 'do-it-yourself' dryer.

MS bar, 10 mm dia	8.0 m
GI wire	20.0 m
Polyethelylene sheet (200 gauge)	8.0 m
Black painted palmyra mat	One

for reinforcement, a polyethylene cover, and hooks. The black painted palmyra mat is spread on the floor. The MS bar frame (10 mm diameter) with its base made of 25 × 25 × 3 MS angle is then placed over the mat, thereby securing its position on the ground. The frame is fabricated with a slant equal to the angle of latitude of the place. The GI wire is tied on the frame 15 cm apart to create a frame-work to support the double-layer stitched cover of 200-gauge transparent polyethylene sheet. The lower ends of the cover are tied to the frame by circular rings or hooks made of GI wire. For air circulation, 0.75 to 10 mm diameter holes are made using heated MS rod at front and rear top and sides of the polyethylene cover. The inclined side of the frame is kept facing south. The drying surface area of the phototype dryer is 1.17 m^2, but this can be varied as required. The transparency of the duble-layer polyethylene sheet was 80%.

The quantities of different materials required to construct a dryer having 1.20 m^2 surface area are given in Table 1.

Operation and performance

This dryer was used for drying of cop and black pepper. The time required for dryi these products and the spreading density co pared to open sun drying are given Table 2.

The solar radiation entering through t polyethylene cover is absorbed by the dryi material and the black surface of the mat. T heat thus trapped raises the temperature air in the enclosure facilitating drying of t wet products. The cycle of natural air circulatio takes place by entry of fresh air from the botto and exit of saturated air from the top.

The average temperature in the enclosur was found to be 36.2°C compared to 30.4° of the ambient air at rh of 60%.

This simple construction was found to dr the product quicker even at higher spreadin density. Further, the quality of the dried produc was superior and free from contaminatio of dirt and dust.

Table 2. Results of drying in 'do-it-yourself' dryer compared to open drying.

Commodity	*Drying method*	*Spreading density*	*Drying time (days)*
Copra	—Open drying on black painted mat	40 nuts/m^2	7.0
	—'do-it-yourself' dryer	60 nuts/m^2	5.5
Black pepper	—Open drying on black painted mat	5 kg/m^2	5.0
	—1st day open drying + 'do-it-yourself' dryer.	12 kg/m^2	4.0

When not in use the dryer can be dismantled and the cover kept folded for use in the next season. However, the dryer can be used throughout the year for drying domestic food preparations requiring open sun drying.

Reference

1. R.T. Patil, 'Design and development of solar copra dryers', *Agricultural Mechanization in Asia, Africa and Latin America*, 1984, vol 15, no. 1, 59-62.