Solar cabinet dryer for plantation crops

DRYING is an important primary processing operation for most of the crops. It is all the more important for plantation crops where quality of the final products is very much dependant on drying. Conventionally, these crops are dried in open sun where drying time required varies from 7 days to 45 days depending on the crop. Drying the crops using freely available solar energy is the most economical proposition and it is essential that this energy may be harnessed to its fullest extent and utilized efficiently. For this purpose, a small capacity solar cabinet dryer was developed by the author at Central Plantation Crops Research Institute, Kasargod.

The most effective time during the day for solar drying is from 10 am to 3 pm, when the maximum solar radiation is received on the earth. If the surface is kept inclined equal to latitude of the place, it receives about 14% more solar radiation. If this inclined surface is rotated and kept facing sun, the solar radiation received would be about 23% higher than on the flat surface. The dryer develqped utilizes this strategy for harnessing maximum incident solar radiation.

The solar cabinet dryer

The frame of the dryer is made of locally available jack wood. The drying surface of 1.06 m² area is of 22 gauge corrugated GI sheet to get absorber area of 1.19 m². The drying surface has been kept inclined to 12.5° (latitude) and fitted on a 3 cm thick jack wood plank board with 2 kg coir fibre insulation in between. The drying chamber is made of 3 mm window glass on sides and 3 mm acrylic plastic sheet on the top to avoid the risk of breakage during handling. The height of the drying chamber is kept at 40 cm uniformly from inlet to exhaust end. Inlet and exhaust of 0.35 m² with wiremesh are provided for air circulation. Commercial grade aluminium foil mounted on the hard board is used for reflectors on three sides. The reflectivity of such surface has been reported as 74% to 85% (Anon, 1974). The total area of the reflectors is 1.5 m². The inlet opening is covered by black painted GI sheet hood inclined at 45°. The area of the hood is 0.36 m² and serves as preheater for incoming air and avoids the effect of direct air drought. Castor wheels are provided for changing the direction and movement to short distances. The GI rod on top cover guides position of the dryer (Fig. 1).

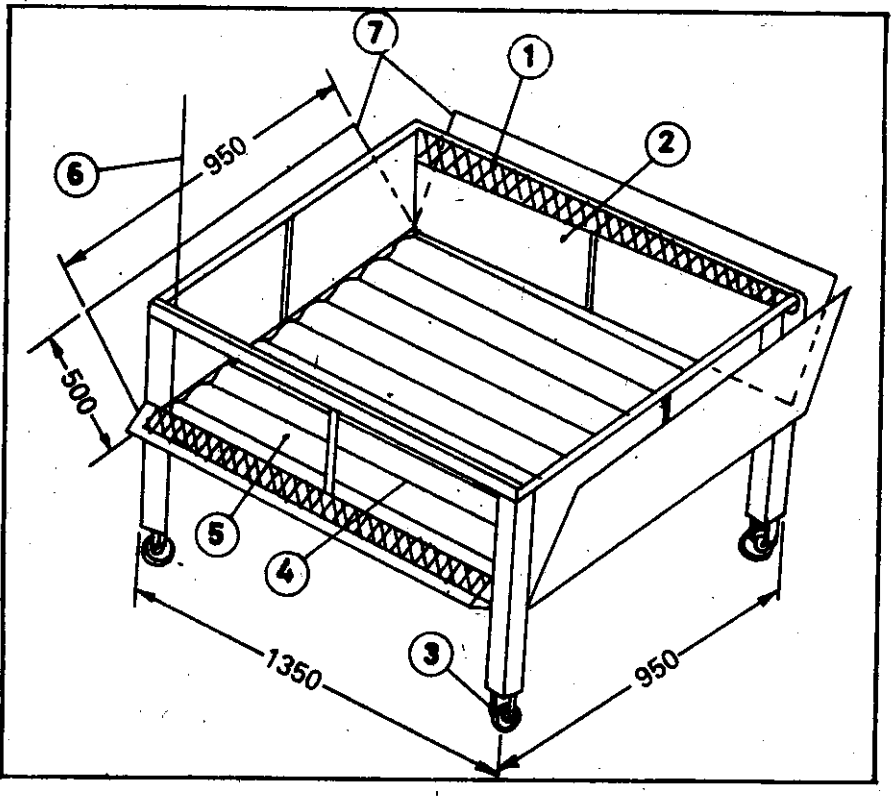

Fig. 1. CPCRI solar drier (1) Wire mesh covered exhaust, (2) 3mm plastic sheet, (3) castor wheel, (4) 22 gauge corrugated G.I. sheet (black painted), (5) 3mm window glass, (6) sun tracking rod, (7) 24 gauge commercial grade alu foil reflector

Operation

The direct solar radiation is received by the material and also by black surface. The additional sun beams are also reflected by the reflectors on the material. This light energy after absorption is converted in to heat energy which is not allowed to go out by the glass and acrylic plastic enclosure. This heat raises the temperature of the air within the dryer and increases its moisture holding capacity. The hot air with moisture escapes from exhaust making room for fresh air coming from the inlet. This maintains the current of air which dries the material. The air in the dryer was found to have a temperature higher by 16°C compared to ambient under high humidity conditions prevalent in Kerala.

Uses

The dryer was tested for drying copra, black pepper and arecanut and the performance is shown is Table 1. It is now possible to dry

Table 1. Performance of solar cabinet dryer compared to open sun-drying

Sl. No.	Crop	Drying method	Spreading density	Drying time
1.	Copra	Open	40 units/m²	7days
		Cabinet dryer	80 nuts/m²	4 days
2.	Arecanut	Open	15 kg/m²	40 days
		Cabinet dryer	50 kg/m²	30 days
3.	Black Pepper	Open	5 kg/m²	5 days
		Cabinet dryer	18 kg/m²	4 days

material with higher spreading density and in shorter time. The quality of the product obtained has been found superior because it does not get exposed to blowing winds. In case of black pepper, the additional benefit of improvement in colour was also observed due to mild heating of the berries during cabinet drying.

The dryer costs only Rs. 2000 (1986) and is a useful processing device for small plantation crop holdings.

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NOMINATIONS INVITED

Shanti Swarup Bhatnagar Prizes in Science and Technology for 1989

NOMINATIONS are invited by the Council of Scientific & Industrial Research for the Shanti Swarup Bhatnagar Prizes in Science, including engineering and technology, for 1989. The prizes are to be given for research contributions made primarily in India during the past five years. The upper age limit of nominees for the prize is 45 years.

Five or more prizes each of the value of Rs. 50,000, may be awarded annually for notable and outstanding research, applied or fundamental, in the following disciplines: (1) physical sciences, (2) chemical science, (3) biological science, (4) engineering sciences, (5) medical sciences, (6) mathematical sciences, and (7) other sciences.

Those who can make nominations include: presidents of approved scientific societies of all India character, vice chancellors of universities, deans of science, engineering and technology and medical faculties, directors of Indian Institutes of Technology, deans of faculties and heads of institutions deemed to be of university status, directors general of major R & D organizations such as the Defence Research & Development Organisation, Indian Council of Medical Research, Indian Council of Agricultural Research, India Meteorological Department; Chairmen of Atomic Energy Commission, Electronics and Space Commission, Oil & Natural Gas Commission, Science Advisory Committee to the Cabinet, etc., directors of CSIR laboratories, Bhabha Atomic Research Centre, Tata Institute of Fundamental Research, Physical Research Laboratory, Indian Association for the Cultivation of Science, etc., and Secretaries of the Department of Environment, Department of Science and Technology, Department of Electronics, Member-in-Charge of Science (Planning Commission) and the Bhatnagar prize winners. University faculties should recommend persons working in their institutions only and route the nominations through their respective vice chancellors, while the faculties in IITs should send their nominations through their directors. Directors of CSIR laboratories can nominate candidates in the discipline of their interest, irrespective of whether they are working in CSIR or outside. Each Bhatnagar prize-winner can send the nomination of one person for each year's award in his own discipline only. Each such nomination shall give a detailed statement of work and attainments of the nominee, and a critical assessment report (in not more than 500 words) bringing out the importance of the significant contributions of the nominee made during the past five years. Nominations from individuals sponsoring their own names or of others will not be accepted.

Nominations may be sent by registered (acknowledgement due) post along with 20 copies of detailed statement of work and attainments of each nominee and the discipline under which the nominee is to be considered. The attainment of the nominee during the past five years may be highlighted, and sent along with one set of reprints of papers published during the 5-year period. Nominations signed by the sponsors should be sent, marked 'confidential', to the Head, Extramural Research, CSIR Complex, Pusa, New Delhi-110012 by 31 March 1989. Regulations governing the prize and the proforma for nomination may be obtained from the above address.