

# CIFT Dryers for value addition

Affordable, Energy efficient and Eco-friendly

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**K**erala is a coastal state. The coast of Kerala constitutes approximately 10 percent of India's total coastline. Fishing is the only source of livelihood for more than 8 lakh marine fishermen. There are 222 fishermen villages in this State. Fishermen in Kerala catches fish as major aquatic products and are intended mainly for domestic consumption and sale in the local market. However, in case of over catch, tremendous losses occur because the fishermen have neither access to markets in big cities nor to the international market due to poor product quality and absence of good marketing and distribution system. As an alternative, fisherman can convert the catch into value added products viz., dried fishery products, smoked and salted fish etc, with enhanced shelf life and market value.

## Traditional drying method and its drawbacks

Drying preserves fish from decay by removal of moisture from fish, thereby arresting the growth of bacteria, action of enzymes and chemical oxidation of the fat. In Kerala, 30-40 % total catch of fish is dried or processed for export and local consumption. Open air sun drying is the traditional method employed in Kerala to dry fish and fishery products, known for higher microbial load and lower product quality. It denotes exposure of the commodity to direct solar radiation and the convective power of the natural wind for removal of moisture. But it often results in inferior quality of product due to its dependence of weather conditions and vulnerability to the attack of dust, rains, insects, pests, and microorganisms. Also, it requires longer drying time.

## Solar dryers for high quality products

Solar drying is an alternative which offers numerous advantages over the traditional method,

apart from being environmentally friendly and economically viable. In solar drying, a structure, often of very simple construction, is used to enhance the heating effect of the solar radiation. Compared to the sun drying, solar dryers can generate higher air temperatures and consequential lower relative humidity, which are conducive to improved drying rates and hence lower moisture content of the final products.

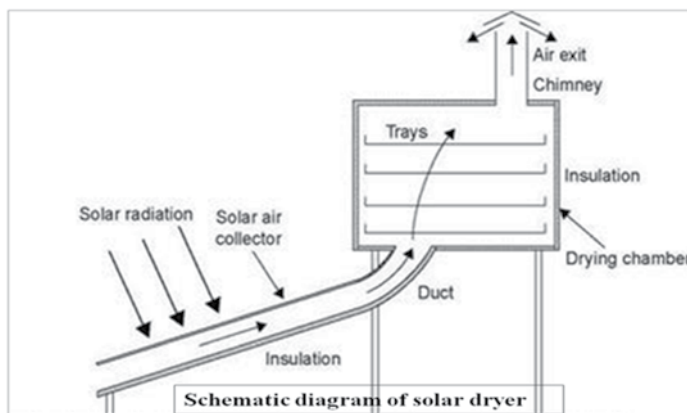
### Major parts of Solar dryer and its advantages

The essential parts of solar dryer includes solar collector, drying chamber and air flow system (Inlet & Exhaust). Solar collector consists of a glass cover and an absorber plate. The drying chamber consists of trays stacked one over the other at equal distant in which the material to be dried is placed. The ambient air enters into the solar collector in which air gets heated up and moves to the drying chamber and flow across the trays. The heated air after removing moisture from the material moves out through exhaust system. The advantages of solar drying are,

- Uniform and hygienic drying
- Eco-friendly / No GHG emissions
- Low cost
- Energy efficient
- Quality and food safety
- Reduced drying time

### Different types of CIFT dryers

ICAR-Central Institute of Fisheries Technology (CIFT), Cochin, has been in the service of the nation since 1957 under the Indian Council



of Agricultural Research (ICAR), New Delhi. CIFT has developed low cost, energy efficient and eco-friendly dryers like Solar tray dryer, Solar cabinet dryer, Solar tunnel dryer etc based on solar energy for quality drying of fishes. Apart from fishes, this dryer is also suitable for drying other agricultural products like fruits, vegetables, spices and condiments. All of these dryers are provided with alternative heating source in order to continue the drying process during off sunshine hours especially during night time, cloudy and rainy days.

### Solar tray dryer

Solar tray dryer (Fig. 2) consists of solar air collector, drying chamber with trays and exhaust. The capacity of the dryer is 20 kg. The total heat absorbing area of solar collector is 10m<sup>2</sup> and drying chamber tray area is 5.4m<sup>2</sup>. The trays are made of food grade steel (SS 304) and are stacked one over the other with spacing of 10 cm. In this dryer, supplemental heating is provided by electrical coils placed in the drying chamber.



Salted butterfly cut mackerel in plastic crates



Mackerel loaded in cabinet dryer





### Solar cabinet dryer

Solar cabinet dryer (Fig. 3) consists of four drying chambers with nine trays in each chamber. The capacity of the dryer is 40 kg. The total tray area is 20m<sup>2</sup>. The trays are made of food grade steel (SS 304) which is stacked one over the other with spacing of 10 cm. The perforated trays accomplish a through flow drying pattern within the dryer which enhances drying rates. Solar flat plate collectors with an area of 7m<sup>2</sup>, transmit solar energy to the air flowing through the collector which is then directed to the drying chamber. Electrical back up starts automatically whenever the desired temperature is not attained in the drying chamber, particularly during rainy and cloudy days.

### Solar tunnel dryer

Solar tunnel dryer (Fig. 4) utilizes solar energy as the only source of heat for drying of fish and fishery products. The capacity of the dryer is 5 kg. Total heat absorbing area is 8 m<sup>2</sup>, and is made up of polycarbonate sheet. Products to be dried are placed on nylon trays of dimension 0.8 m × 0.4 m. The dimension of the drying unit is 2.21 m × 2.10 m × 0.60 m, and drying takes place by convection of hot air within



the drying chamber.

### Experimental findings of CIFT dryers

Generally prior to drying process, fish is properly cleaned and sometimes salted (Fig. 5) to assist the drying process and/or to maintain the hygiene. Experiments conducted for various fishes namely Mackerel, Sardine, Nandan and Sole fish proved that these dryers are efficient in maintaining quality and food safety of the dried products (Fig. 6). The temperature of drying is around 45-55°C and time required to complete the drying is around 6-8 hrs. The final moisture content of dried

fish is in the range of 15-18% in wet basis (weight of water in the material to total weight of that material). The approximate cost of solar dryer (40kg capacity) with electric backup varies from 1.5 – 2 lakhs. Through these CIFT solar dryers, fish can be dried uniformly under hygienic conditions with increased shelf life and higher market value. In addition, CIFT have developed few more innovative dryers for quality drying of fish and other agro-products like Solar-biomass backup dryer, Solar - LPG hybrid dryer and Infrared dryer.