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SOLAR DRYING: AN EFFECTIVE ALTERNATIVE

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Abstract - For a country blessed with an abundance of solar radiation throughout the year, we still lack the implementation of solar-powered devices. Drying has been practiced for ages to prolong the shelf life of food products. Although not much has changed in the drying process, as even today sun drying is the most practiced form of drying. This needs to change as traditional sun drying is slower, prone to germs and final product quality is not up to the mark. The solar drying technologies make the process quicker, maintain quality, and even preserve the colour.

***Key Words*:**solar dryer, photonics, light, lasers, templates, journals

1.INTRODUCTION

1.1 PURPOSE: Being an agrarian nation, Indian farmers face the dilemma of a surfeit of food products during a cultivation cycle and due to improper storage, the food losses are almost up to 17% every year. Solar drying enables the drying of these excess food products and increases their shelf life also providing economic benefits. Solar drying can be practiced for drying a variety of food grains, meat, and fruits. Being a nation with an abundance of sunlight, the solar dryer is an incredible option for rural areas which lack proper electric supply.

1.2 PROJECT SCOPE: To present a cost-effective and income-generating alternative to traditional drying methods, as well as a renewable, long-term solution to our country's food waste problem. To provide user-friendly and low-maintenance technologies that harness non-renewable energy that can be employed in rural areas.

2. LITERATURE SURVEY

1]Solar Drying: Fundamentals, Applications, and Innovations -Editors:
Ching Lik Hii, Sachin Vinayak Jangam, Sze Pheng Ongand Arun Sadashiv Mujumdar:
We learned a lot about the entire process of designing and manufacturing a solar dryer. The book contains information ranging from the fundamentals to the intermediate level of solar drying. It also teaches the numerous calculations required as well as the factors impacting drying effectiveness.

2]Solar Drying Technology Concept, Design, Testing, Modeling, Economics, and Environment - Om Prakash, Anil Kumar:
We gained ready insights into the manufacturing and monetary aspects of the entire solar dryer production process as a result of this publication. The contents also include information on numerous advances implemented in this industry.

3. COMPONENTS AND COST ESTIMATION

Table-1

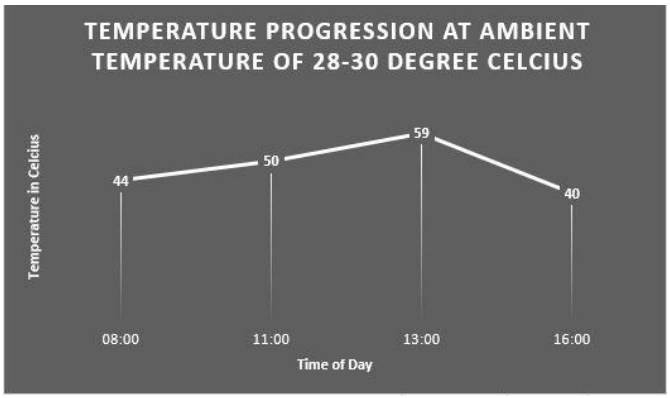
Sr no	Component	Specifications/ Material	Qty.	Cost (Rs.)
1	Frame & Legs	Galvanized Steel	(20 feet*3)	30/ft
2	Corrugated sheet	Metal	1	410
3	Solar sheet	200 microns	1	900
4	Tray	wood	3	366
5	Nut bolts	Std M.S.	4	20
6	Velcro	Std	As required	100
7	Metal mesh	STD	3	430
8	C channel	Std M. S	6	280
9	Paint	STD Black	1	170
10	Glass	Std (3mm thickness)	1	550
11	Pipe	PVC	As required	NA

4. METHODOLOGY

We have used Galvanized steel for the structure, as it should have the rigidity to hold weight and also provide a stable setup. We decided on a 1*1inch square pipe for the structure and made the setup such that each tray would have 3.5*2 feet of area for drying and decided on inculcating 3 trays in our system. In order to make the model a bit more mobile, we decided on separating the collector and drying part and both are constrained back with a simple 4 screw attachment. Furthermore, in order to maintain the temperature inside the drying chamber, we have used a solar sheet of 200 microns to cover the whole setup. For the collector, we used a corrugated sheet and applied black paint to it in order to increase the temperature after exposure to the sun. In addition to this, we installed glass having 3mm thickness for further increasing the temperature of the corrugated sheet. The bottom opening of the collector is covered with a mesh for preventing insects from entering the setup. The drying chamber was attached with the exhaust setup, consisting of 2 PVC pipes which greatly reduced the cost of exhaust. We used the c channel for easy placing and removal of trays. The trays are made from wood to keep the weight of the tray light and the cost

low, and metal mesh is clipped to the wooden tray. Finally, in order to open and close the drying chamber, an ingenious solution of integrating Velcro was implemented which resulted in an economical alternative to the hinge system generally used. The Velcro was sewed on the solar sheet, and the other side of the Velcro is fixed to the frame using adhesive. Because the materials are all readily available and reasonably priced, this design can be implemented practically anywhere.

5. OBSERVATIONS AND REFERENCE IMAGES



Graph-1: Temperature progression graph

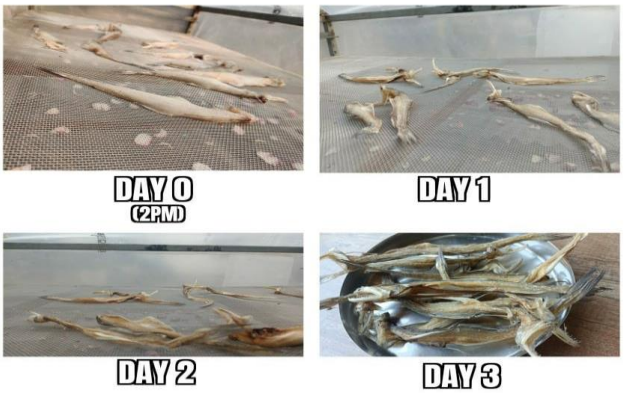


Fig 1-Fish drying over a period of 3 days

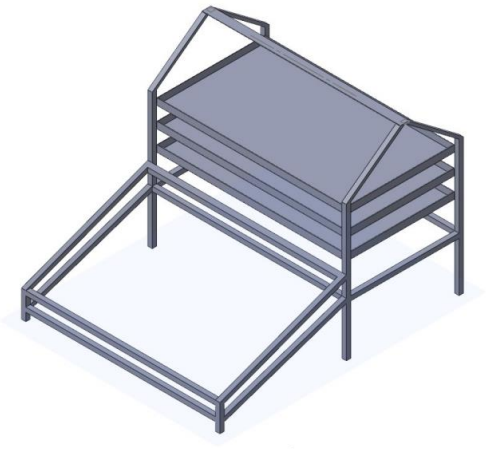


Fig 2- Solar dryer solidworks model

Fig 3- Solar dryer model

6. CONCLUSIONS

This project enabled us to find an excellent alternative to the traditional sun drying methodology. We conducted various tests involving drying of fish, coriander, ginger, and tomatoes. Our primary aim was to find a money-making solution which we achieved by drying of fish and selling dried fish for a profit. We bought 5 kgs of Bombay duck for 120rs/kg and were able to sell it after drying for 200rs/kg as the quality was quite good. Thus, we concluded that this device has an excellent return on investment as the operating and maintenance cost is negligible.

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