

Testing and Evaluation of the Chimney Type Solar Dryer (CTSD) for Cottage Industries in North

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Food technology in Sri Lanka is a desired need of significant development to make value added product of a wide variety of both fruit and vegetables. There is a massive surplus production during the season. However, it is perishable in nature. Therefore, proper post harvest handling and preservation are essential. Fruits and vegetables are highly profitable commodities for both small-scale and large-scale farmers. Unfortunately, fresh produce is very perishable and postharvest losses can be quite high. Hence, researches have been initiated in the dehydration of vegetables. The newly designed solar drier with heated air circulation focuses the method of improvement in moisture removal and cost reduction. The dryer comprises of a long table covered with black plastic, which is connected to a chimney at one end. The principle of the solar chimney effect is a combination of solar stack-assisted and wind-driven ventilation. The use of the solar energy is getting a greater importance in the agriculture as because of the growing energy prices and the importance of the environment protection. Solar driers can generate higher air temperatures and lower relative humidity. Initially the rate of moisture removal (g/min) was high, which gradually it was decreased none linearly. Drying process was analyzed by the regression value in the model of moisture removal rate (gram of water per minute) and temperature gradient in °C (ambient – inside temperature) for different produces like lime and chilli, which are high and low range (80 & 60 %) moisture vegetables. Comparative study was performed in open space sun drying. The regression model can be used for the prediction of drying efficiency explained by regression value and duration at particular temperature gradient. Best-fitted exponential model for moisture removal rate was obtained in two extreme moisture conditions by the equation of $0.024 e^{0.0521x}$ for lime with the regression value of 0.9668 and $0.015 e^{0.0778x}$ with the regression value of 0.9726 for chilli respectively. Chimney Type Solar Dryer (CTSD) design was performed at high efficiency compared to open sun drying.

Keywords: Chimney solar dryer, Design, Dryer, Fabrication