

# Design, Construction and Performance Study of a Low Cost Solar Dryer for Food Preservation in Bangladesh

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## Abstract

The solar drying system utilizes solar energy to heat up air and to dry any food substance loaded, which is beneficial in reducing wastage of agricultural product and helps in preservation. The objective of the thesis is to design, develop and evaluate performance of an indirect solar dryer using thermal energy storage for the drying of vegetables and other foods. Later the future prospects in Bangladesh have been discussed in details.

This design was employed by measuring various features such as cost, efficiency, durability and has compared with the performance testing through parameters such as temperature, air velocity, collector efficiency and weight loss. It was shown that the use of this type of solar dryer reduced the drying time significantly and essentially provide better product quality compared with conventional drying method. The effect of temperature to moisture contents against time and rate of drying are studied in this thesis.

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## LIST OF SYMBOLS

$m_a$	Air mass flow rate (kg/s)
$C_p$	Air specific heat capacity (J/kg.K)
$T_0$	Air temperature outlet from solar collector (°C)
$T_1$	Air temperature inlet to solar collector ( <i>ambient air temperature</i> )
$I$	Solar radiation ( $\text{W/m}^2$ )
$A_c$	Area of solar collector ( $\text{m}^2$ )
$M$	Mass of the crop (kg)
$L$	Latent heat of evaporation of water at the dryer temperature (kJ/kg)
$t$	Time of drying (s)
$h_0$	Abs humidity of air leaving the chamber (kg/kg)
$h_i$	Abs humidity of air entering the chamber (kg/kg)
$h_{as}$	Adiabatic saturation humidity of air entering the chamber (kg/kg)
$M_0$	Initial product mass (kg)
$M_t$	Product mass at time (kg)
$A$	Area ( $\text{m}^2$ )