

Efficiency Analysis of the Ecosolar Instore Onion Dryer for Shallot Farmers in Brumbungan Lor Village, Probolinggo Regency

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ABSTRACT

*The drying process of shallots (*Allium cepa* L.) generally still relies on conventional sun drying under direct sunlight, which is highly dependent on weather fluctuations and susceptible to environmental contamination. This study aims to evaluate the thermal performance and system efficiency of a solar panel-based shallots dryer. The research method employed is an experimental method using whole shallot bulbs, with a weight of 500 grams placed on each of the 4 available trays. Parameters observed throughout the testing included moisture content, weight loss, drying rate, and system drying efficiency. The results indicated that the device was capable of achieving an average temperature ranging from 45.23 °C to 49.22 °C, while maintaining the internal relative humidity within an average range of 37.67% to 45.04%. The temperature, humidity, and stable airflow rate parameters proved to have a significant effect on the drying rate value, where a higher temperature causes a decrease in relative humidity, thereby accelerating the overall drying rate. Furthermore, the Ecosolar Instore Onion Dryer produced a material weight loss percentage ranging from 22% to 28%. The optimum drying performance was achieved on tray 2, yielding the highest average drying rate of 32.80 gramH₂O/hour during the fourth day of testing. Overall, this drying device was capable of achieving an average drying efficiency of 11.14% on tray 1. Tray 2 recorded the highest efficiency with an average of 11.39%, followed by tray 3 at 9.93%, and the lowest drying efficiency was observed on tray 4 at 9.71%.*

Keywords: shallot, drying efficiency, drying rate, solar panel, drying system.