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Automated Temperature Control in Solar Crop Dryers Using Artificial Intelligence: A Sample Abstract

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ABSTRACT

Background: Solar dryers are used for preserving agricultural foods, but their efficiency changes constantly due to unpredictable weather. Traditional control methods are not enough to adopt sudden changes in atmospheric conditions. Applying Artificial Intelligence and Machine Learning (AI/ML) provides a modern solution to predict and control drying behaviors dynamically. **Objectives**: The main goal of this research is to develop an intelligent ML model that optimizes the temperature inside a solar dryer. The study aims to reduce food spoilage and maintains high nutritional quality during the drying process. A major focus is making this smart technology affordable and easy to use for small-scale farmers. **Methods**: Real-time data on temperature, humidity and solar radiation was collected over a three-month testing period. This data was used to train an Artificial Neural Network (ANN) model to predict optimal airflow speeds. The smart system was then compared directly against a traditional, manually operated solar dryer to measure performance. **Results**: The AI-driven solar dryer reduced total food drying time by 12 % compared to traditional methods. It maintained a stable internal temperature, which improved the quality retention of the dried food by 9 %. Furthermore, the system successfully predicted weather changes 10 minutes in advance to prevent overheating. **Conclusion**: Implementing machine learning algorithms significantly enhances the efficiency and reliability of solar crop preservation. This approach proves that advanced computing can be practical and accessible for sustainable agricultural applications. Future work will focus on installing this model onto low-cost microcontroller chips.

Keywords: *Artificial neural networks; crop preservation; machine learning; solar food dryer.*