Entry No. IRRC-0182

Category	: International Rice Research Conference
Select Theme	: Food systems for the future
Endorsement email	:
Keyword 1	: Processing technologies
Keyword 2	: Improved post harvest technologies
Keyword 3	:
Title of Entry	: Mathematical Modeling of Flat-bed Rice Dryers with Reversed Airflow
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Select only one type of presentation	: 15 minute oral presentation
Abstract	: Dryers of various configurations are used in rice-producing regions of the world. The goal of the presented research was to develop a mathematical model that accurately describes heat and mass transfer processes between rice kernels and air, in a variety of rice dryers, in particular, cross-flow and flat-bed dryers. The model is capable of predicting air and rice temperature and MC throughout such driers. The model was also used to evaluate the role of reversed airflow in flat-bed rice dryers. To validate the model, an experimental setup was fabricated to simulate rice drying with an option of reversed airflow; laboratory-scale drying experiments were performed to measure rice MCs and air temperatures across the column thickness, which were then compared with the model predictions. The model successfully predicted grain and air properties, with and without reversed airflow; the root mean square error between the predicted and measured values of rice MC and air temperature were within 0.1 - 0.2 percentage points and 1ºC - 4ºC ranges, respectively. Airflow reversals were shown to reduce non-uniformity of drying in the rice bed; in tested drying conditions, a single airflow reversal was more successful in reducing variation in MC than twice airflow reversal. As such, the model could be applied to improve dryer design (particularly the number and arrangement of airflow reversals) and optimize drying operation parameters so as to achieve greater drying capacity, and energy efficiency in commercial drying operations.

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