

CHAPTER VIII

SUMMARY AND CONCLUSION

A thin-layer air drying apparatus was designed and constructed. Experimental data describing the thin layer drying rate for long grain rough rice (RD7) were obtained in this apparatus under controlled conditions. The test variables considered include the initial moisture content of rough rice (20 to 40 percent dry basis), drying air temperature (35 to 60°C) and drying air relative humidity (30 to 70 percent).

The observed drying data have been fitted to three mathematical models. The first model was based on an approximate form of diffusion solution and the others were empirical models. The first empirical model was a modified form of Page's model while the second was a quadratic model. The coefficients and exponents for these models are described in terms of the test variables. The developed models were compared for both accuracy and computational ease with each other. Finally the most suitable thin layer drying model for further deep-bed drying simulation.

The best available model found in this study is the modified form of the Page's model with the exponent as functions of drying air relative humidity and initial moisture content of rough rice while the coefficient as functions of drying air temperature and relative humidity and initial moisture content of rough rice. This selected model was next used to simulate the drying rate of a deep-bed dryer.

A fixed-bed dryer was designed and constructed and five experiments with fixed beds of rough rice were carried out using various inlet air conditions and initial moisture content of rough rice. The air temperature and moisture content of rough rice at various heights within the beds were measured periodically.

A computer program based on energy and mass balances was developed to simulate the deep-bed drying. Experimental data from the dryers were compared with the results from this program. The results showed that the simulated drying rates and drying air temperature between the layers were slightly higher than those experimentally observed. The major difference between the simulated and experimental values was found in the top of the deep bed. However, they showed good agreement of the shapes of the moisture and temperature profiles.