ABSTRACT.

Solar dryer greenhouse is one of the methods for drying products using solar energy. Solar dryer greenhouse offers a low cost dryer as it can dry products in bulk quantities due to its big size compared to other types of dryer. MARDI* has built small-scale solar dryer greenhouse with a drying chamber size of 4.5m width x 4.5m length and 3 m height equipped with side opening at each side wall . The solar dryer is also equipped with a chimney with a size of 0.3m width x 0.3m length x 3.0m height, which has opening at the top. The objectives of this study are to simulate the climate inside the solar dryer greenhouse in terms of temperature and air flow velocity, and to study for possible improvements which can be done to make the solar dryer greenhouse more efficient. The simulation was done using commercial CFD software which is ANSYS CFX version 12.1.

Two different conditions of the solar dryer greenhouse were simulated. The first condition is where the roof and side openings are opened, and the second condition is where only roof opening is opened. For each condition, two days were selected and three different times in a day were simulated, which were 10.30 am, 1.30 pm and 4.30 pm. Actual data for solar radiation, wind speed, wind direction and temperature were measured and used to verify the CFD simulations. The results from CFD simulations and actual data are comparable. The average percentage difference between the measured and simulation temperature data is within 5.5%. For temperature difference between inside and outside air, the difference obtained from actual and simulation data is within 1.5^{o}C. Based on this data, it can be assumed that the CFD model can represent actual conditions with relatively good precision. Suggestions for improvement are carried out based on the validated CFD model to investigate further on solar dryer greenhouse design, which can further increase the temperature difference between inside and outside air of the dryer and to increase air flow velocity.

*MARDI – Malaysia Agriculture Research and Development Institute.