TESTING THE APPLICABILITY OF APSIM-ORYZA MODEL FOR MODELING ORGANIC RICE PRODUCTION SYSTEMS: SRI LANKAN EXPERIENCE

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The APSIM (Agricultural Production Systems Simulator) is internationally recognized as a highly advanced platform for modeling and simulation of agricultural systems. It contains a set of modules that enable the simulation of systems for a diverse range of plant, animal, soil, climate, and management interactions. APSIM model is widely used for modeling growth and yield of many crops; however, it has been rarely tested on organic agriculture. Sri Lankan farmers rethink about organic rice production systems, due to inherent environmental and health problems of conventional agriculture. Hence, this study aimed to test the applicability of the APSIM model to simulate the growth and yield of organically grown rice and the impact of weeds on organic rice production systems. There are only a few rice cultivars included in the APSIM-Oryza model; therefore, the model was carefully parameterized, calibrated, and validated for the local conditions before using it. Hence, local varieties Bg300 and Bg352 were introduced to the APSIM-Oryza model, and cultivar parameters were optimized using apsimr and DEoptim packages of R software. The calibrated model was used to simulate the growth and yield of rice under organic conditions and also evaluated the impact of weed management. Simulated and observed data were plotted to identify the similarity between the predicted and observed values for both cultivars. The calibrated model performed well, as predicted yield of Bg300 and Bg352 with an RMSE value of 548.7 and 439.7 rRMSE value 11% and 9.6% under validation data set RMSE value 716.3 rRMSE value 14.25%, respectively. There was a good agreement between the simulated and observed yield. Also, results showed a relatively higher yield of rice after managing weeds. It is possible to conclude from these results that the APSIM-Oryza model can be successfully applied to simulate the growth and yield of the organic production systems.

Keywords: APSIM, Cultivar parameters, Organic rice, Weed management