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MODELING THE EFFECT OF WATER STRESS ON PADDY YIELD USING APSIM

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Climatic variability, moisture stress, continuously increasing population and changes in the market infrastructures are the main driving forces altering agricultural productivity. Associated impacts of increasing temperature, changing rainfall pattern and intensity have led to reduced agricultural productivity and yield losses all over the world. Due to the variability associated in the paddy cultivation, decision making process has become a difficult task. Further, analyzing the effects of different management options after the growth/ crop season is a risk and an additional cost to the farmer. Therefore, crop models have been found to be an effective method for analyzing different decision making processes and management options in crop cultivation. In this study, Agricultural Production Systems Simulator (APSIM) was used to model the effect of water stress on rice yields. Farmers who cultivated Bg 358 during 2011/12 *Maha* season were selected as the study population. The model was calibrated using leaf area index (LAI) data from a field experiment conducted for Bg 358 at Batalagoda Rice Research & Development Institute (RRDI) during 2010 *Yala* season. Model validation was done using yield data taken from National Coordinated Rice Varietal Trial at RRDI from 2005 to 2009 *Yala* seasons. In addition, the model was evaluated under different water management options (*i.e.* irrigation only, rainfall only and irrigation + rainfall) to identify impacts of water stress condition for rice cultivation. Simulated rice yield for Bg 358 was (dry weight) 5286.4 kg/ha during the model calibration, while, the observed yield at 20 % moisture content (dry weight) was 4432 kg/ha. No significant difference was observed between the simulated and the observed rice yield. The observed non-significant difference (854.4 kg) was due to the simulations carried out under optimum growth conditions without any pest and disease damages. A 97.6 % coefficient of determination, (R^2) was obtained for the regression between simulated and observed LAI. However, R^2 was found to be 25.6 % for the model validation. Model validation was unsuccessful due to the lack of time series data and due to the time limitation for data collection during the study. According to the results of different water management options, the simulated yield was higher under the irrigation + rainfall water management option compared to other two options. However, fields located in low land areas of the study area gave high yields under no irrigation, as those areas have high soil moisture conditions than other areas.