

IMPACT OF EXTREME CLIMATE CHANGE ON THE PRODUCTION OF BORO RICE IN BANGLADESH USING DSSAT 4.6

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ABSTRACT

Impact of extreme climate change on the production of BORO rice in Bangladesh has been evaluated using the DSSAT 4.6 crop modeling software. The model was calibrated using BR29 variety of BORO rice for the years 2007-2010 and validated for 2011-2014 incorporating BBS data with statistical parameters RMSE and NSE. There are 8 genetic coefficients for BR29 variety of BORO crop which are the calibration parameters of BORO rice in DSSAT 4.6. Impact of future climate is analyzed considering baseline period of 30 years from 1991-2010. The future yield was analyzed for Near Future or the 2030's (2021-2050) and the Far Future or the 2080's (2070-2099) using 7 bias corrected ensembles of regional climate models (RCMs) for whole Bangladesh divided in 64 districts. The soil profile data was integrated in DSSAT by extracting the available 14 soil databases of Bangladesh in WISE 1.1 soil database. The results show that, for most of the districts, the yield is negative, reaching over 20% decrease in some regions. The maximum temperature rise exceeds 1.5°C in 2030's and 4°C in 2080's whereas the minimum temperature rises up to 5°C in 2090's. This rise in daily temperature over the growing period of BORO rice indicates the adverse impact of temperature on crops. However, the increase in the amount of Carbon dioxide increases the yield up to a certain limit, but this increase is not significant compared to the negative impacts of the rise of temperature. The model also shows a significant change in the yield or rice with the change of transplantation date. This shifting of transplantation date helps to predict the optimum transplantation date that would result in harvesting the maximum yield of rice.

Keywords: BORO Rice, RCM, Climate change, DSSAT 4.6.