ABSTRACT

The demand for food grain under the current trend in rising populations one of the major challenges which is further aggravated due to variability in climate patterns all over the world. Adaption of appropriate irrigation scheduling and nitrogen fertilization level with sowing dates management can maximize the agricultural crop production without compromising on the environmental front. This study is to evaluate the impact of climate variability on maize crop under different management practices i.e. sowing dates and fertilization level for a tropical region of West Bengal, India. Maize crop experiments were conducted for wet season of years 2012 and 2014 as well as for the dry season of the years 2013 and 2014 at the experimental farm of IIT Kharagpur with different sowing dates (wet: 10^{th} and 25^{th} June; dry: 5^{th} and 25^{th} January), and fertilization (N) levels (wet: 0, 60, 80, 100 kg ha^{-1}; dry: 0, 75, 100, 125 kg ha^{-1}). Field experiment results indicated that sowing date of 10^{th} June with nitrogen level of 80 kg ha^{-1} and 5^{th} January with 100 kg ha^{-1} as best sowing dates for the wet and dry season maize respectively. The highest yield of 5891.0 kg ha^{-1} was obtained for wet season maize for N_{100}; while that for dry season maize was 5703.15 kg ha^{-1} for N_{125}. The CERES-Maize DSSAT v4.5 was calibrated and validated using the field experiment results on crop phenology, yield and yield attributes, and soil water content for the wet (Bio-22024), and dry (Tx-367) seasons maize cultivars. Evaluation of different sowing dates under different environmental conditions using past 30 years of historical data showed that 10^{th} and 20^{th} June (15^{th} and 25^{th} January) as the best sowing dates for wet (dry) season maize. The CERES-Maize model simulation for different RCPs 2.6, 4.5, 6.0 and 8.5 show 10-23% loss (7-10% gain) in maize crop yield during dry (wet) season. Through this study, most appropriate sowing date and fertilization level for commonly grown maize cultivar in eastern India during dry and wet seasons were investigated for climate change conditions.

Keywords: Sowing dates, nitrogen fertilization, CERES-Maize, evapotranspiration, nitrogen balance, soil water balance, climate variability, adaptation