Abstract

In this research, the integrated effects of long-term variation in climate variables and irrigation performance management on maize yield and water productivity was investigated in Mazandaran province. After calibrating and validating LARS-WG for simulating climatic variables in Noshahr, Ramsar, Gharakheil and Babolsar stations during the base period (i.e. 1981-2010); the model was applied for downscaling climate variable of HADCM3 model and A1B, A2 and B1 scenarios during for the periods of 2011-2040, 2041-2070 and 2071-2100.

Thereafter, DSSAT model was calibrated and validated using the two-year-collected-data in the research field of Sari agriculture and Natural Resource University under three treatments of full irrigation and deficit irrigation at two levels of 55 and 75%. Based on RMSE (9.54-14.7 mm for precipitation, 0.159-0.179 °c for Tmin and 0.11-0.33 °c for Tmax) and EF (more than 91, 99 and 97 percent for precipitation, Tmin and Tmax, respectively), LARS-WG was capable enough for simulating the climatic variables and no significant difference was observed between observed and simulated precipitation and temperature based on t-test analysis 5% significance level.

Also, DSSAT model was capable enough for simulating growth parameter and crop water use for different treatments. a delay in maize cultivation would increase the crop water use by 0.23%-73.3 % with the maximum one for DI75 treatment under B1 scenario in 2071-2100 Period. Early cultivation results in changing maize yield by -25.1 to 35.03%.

Overall, applying deficit irrigation at 55 and 75% level under climate change will change water productivity by -40.7 to 55.9% delay or early cultivation will intensify the negative effects of climate change.

Keywords: Water use efficiny, Maize, DSSAT, Mazandaran, Deficit irrigation

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