

Rice Cultivation Management in Mazandaran Province under Climate Change

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Abstract

Climate change will affect rice water requirement through changes in rice physiology and phenology, soil water balance, evapotranspiration, and green water. Adapting with this major environmental challenge is necessary to maintain or improve the current level of rice production in the future. Considering the vital role of Mazandaran province in supplying rice demand of Iran, this study was conducted to quantify the effects of climate change and different cropping calendars on irrigation water requirement and amounts of green water of the province during rice growing season. Using climatic data of Babolsar, Ghaemshahr, Noshahr, and Ramsar for the base period (1980- 2010) and LARS-WG downscaling model, the weather data of 2011- 2100 were generated under different climate scenarios. Based on the minimum and maximum temperatures, the same cultivation period between current and future periods was selected. Rice water requirement was determined by Neuro-fuzzy inference system. Performance evaluation of LARS-WG model using different statistics indicated suitability of the model to simulate future climate conditions in the region. Under climate change, rice cultivation can start 2 to 23 days earlier and the number of days to physiological maturity will be reduced by one to 20 days. Despite shortening the growing period, due to the negative effects of high temperature and decrease in green water, late planting dates will increase irrigation water requirement. However, suitable cultivation time will reduce rice water requirement of the future up to 681 m³ ha⁻¹. The results demonstrated that management of rice cultivation calendar can be an effective way to achieve sustainable agriculture under future climate condition in Mazandaran province.

Keywords: ANFIS, Cultivation calendar, Green water, Sustainable agriculture, Water requirement

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