파키스탄 밀-옥수수 재배시스템의 기후변화를 반영한 필요수량 산정
Projecting the climatic influences on the water requirements of wheat-rice cropping system in Pakistan

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Abstract

During the post green revolution era, wheat and rice were the main crops of concern to cater the food security issues of Pakistan. The use of semi dwarf high yielding varieties along with extensive use of fertilizers and surface and ground water lead to substantial increase in crop production. However, the higher crop productivity came at the cost of over exploitation of the precious land and water resources, which ultimately has resulted in the dwindling production rates, loss of soil fertility, and qualitative and quantitative deterioration of both surface and ground water bodies. Recently, during the past two decades, severe climate changes are further pushing the Pakistan's wheat-rice system towards its limits. This necessitates a careful analysis of the current crop water requirements and water footprints (both green and blue) to project the future trends under the most likely climate change phenomenon. This was done by using the FAO developed CROPWAT model v 8.0, coupled with the statistically-downscaled climate projections from the 8 Global Circulation Models (GCMs), for the two future time slices, 2030s (2021-2050) and 2060s (2051-2080), under the two Representative Concentration Pathways (RCPs): 4.5 and 8.5. The wheat-rice production system of Punjab, Pakistan was considered as a case study in exploration of how the changing climate might influence the crop water requirements and water footprints of the two major crops. Under the worst, most likely future scenario of temperature rise and rainfall reduction, the crop water requirements and water footprints, especially blue, increased, owing to the elevated irrigation demands originating from the accelerated evapotranspiration rates. A probable increase in rainfall as envisaged by some GCMs may partly alleviate the adverse impacts of the temperature rise but the higher uncertainties associated with the predicated rainfall patterns is worth considering before reaching a final conclusion. The total water footprints were continuously increasing implying that future climate would profoundly influence the crop evapotranspiration demands. The results highlighted the significance of the irrigation water availability in order to sustain and improve the wheat-rice production system of Punjab, Pakistan.

Keywords : climate change, CROPWAT, wheat-rice system, water footprints, Pakistan

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