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Project "Analysis Of Climate Change Effects On Crop Growth By Simulation Models"

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Abstract

Crop growth is very sensitive to variations in meteorological parameters. Reliable estimations of these factors are especially needful when worldwide grown seasonal plants are in question. Hence, this study is dedicated to the introduction of the ongoing project entitled "Analysis of Climate Change Effects on Crop Growth by Simulation Models". The aim of the project is to take a first step to fulfill the lack in related researches in northwest Turkey. The research region was selected as the Thrace, which is quite representative by means of production for some major crops like rice, wheat, maize and sunflower in the country. Two explanatory crop growth simulation models, namely the DSSAT (Decision Support System for Agrotechnology Transfer) and WOFOST (World FOOd STudies) are used for comparatively validation and sensitivity analysis of them. Required collection of simulation data for crop, soil and atmosphere were then followed by model calibration. Until today, wheat and maize crops have been analyzed for completed growing seasons at one location (Kırklareli city) in the Thrace. The results concerning the first growing seasons of winter wheat (9.10.2009-6.7.2011) and maize (27.4.2010-29.9.2010) indicated that especially the CERES (Crop Resource Environment Synthesis)-Wheat and CERES-Maize could represent daily soil temperatures satisfactorily, which was not the case for soil water contents, however. Grain yield approximation of CERES-Wheat was 5151 kg/ha, which corresponded almost 99% to the real value (5190 kg/ha), while WOFOST showed also a satisfactory result as 5166 kg/ha. For maize, the actual yield was 14800 kg/ha, to which CERES-Maize and WOFOST approached with 13718 (7% lower) and 14037 (5% lower), respectively. CERES-Maize and WOFOST models made considerable overestimations for wheat total biomass, even though they represented 88% and 82% of the real maize biomass that was obtained as 27920 kg/ha. In addition to the above mentioned outputs, temporal variations of other relevant parameters such as LAI (Leaf Area Index), evapotranspiration as well as separate crop parts (stem, root, leaves) are monitored and simulated on a daily basis. This research project is going to be continued and concluded by considering additional locations together with possible climate change scenarios for the same crops in the Thrace Region to get a more explanatory picture for the future.

Keywords: Crop Growth Simulation Model, Wheat, Maize, Climate Change, Thrace, Turkey.

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