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Climate change impacts on cereal crops in Northeast Bulgaria

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Global climate change will impact all economic sectors to some degree, but agricultural production is perhaps the most sensitive and vulnerable. World agriculture, whether in developing or developed countries, remains very dependent on climate resources. For example, agriculture in Europe only accounts for a small part of the GDP, and the vulnerability in the overall economy to changes that affect agriculture is therefore low, however the local effects on society might be large. This study shows some model results on climate change impacts on crops in Northeast Bulgaria. Changes in phenological dates and crop yields of winter wheat and maize are simulated by a crop model. RoIMPEL model dynamically calculates the variables with a time step of 1 day as it has functions to derive daily weather data) from monthly values. A screening of soil/climate conditions to evaluate the land suitability for a given crop is first performed. For suitable land, the daily dynamics of the crop development stages up to harvest, and of water-, temperature-, and nitrogen-stresses are the main crop processes simulated in RoIMPEL for each crop. The accumulation of biomass is based on the radiation use efficiency and the net photosynthetically active radiation. The radiation use efficiency is CO2 concentration sensitive. The radiation-potential daily biomass increase is corrected by temperature, water and nitrogen stresses. Additional penalties on crop yields are included through alarm criteria (unfavourable weather parameters during the most sensitive development stages) based on crop specific physiology. The model results are presented in various maps, etc.