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Climate change impacts on main agricultural activities in the Oltenia Plain (Romania)

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Understanding the key drivers of agriculture in relation to climate change as well as their interrelationship with land management decisions and policies, one may be able to project future agricultural productions under certain economic, environmental, and social scenarios in order to minimize their negative impacts.
The paper is aiming to stress upon the importance of modelling the potential impact of climate change on crop production, particularly under the current conditions when natural resources and food supplies are shortening in many parts of the world. Under the given circumstances, in assessing the impact of climate change on agriculture in the Oltenia Plain, the authors used a simulation model CERES (Crop-Environment Resource Synthesis), developed as a predictive and deterministic model, used for basic and applied research on the effects of climate (thermal regime, water stress) and management (fertilization practices, irrigation) on the growth and yield of different crops. In assessing the impact of climate change on maize and autumn wheat crops two applications of CERES model were used: CERES-Wheat and CERES-Maize overlapping two regional climatic scenarios for 2021-2050 and 2071-2100 periods. These models describe, based on daily data the basic biophysical processes which take place at the soil-plant-atmosphere interface as a response to the variability of different processes such as: photosynthesis, specific phonological phases, evapotranspiration, water dynamics in soil etc.
Assessing the impact of climate change on agricultural productivity under the two regional climatic scenarios (2021-2050 and 2071-2100) will reveal their potential consequences on the main agricultural crops in the Oltenia Plain (autumn wheat and maize) depending on the interaction between local climatic conditions, the effect rising CO_2 on photosynthesis and the genetical type of crops.
Therefore, the autumn wheat benefits from the interaction between the rise of CO_2 and air temperature while maize is more vulnerable to climate change, especially to hot and dry RCMs/2071-2100/SRES A1B scenario. Against the current climatic conditions, temperature rise foreseen by both scenarios brings about a decrease of the vegetation period. Under these conditions, the rising of atmospheric concentrations of carbon dioxide (CO_2) during the two climate change projected intervals have a positive effect on photosynthesis, which might lead to increase yields, thus counteracting the negative effect of shortening the vegetation period. Under the same climate change conditions, the maize yield shrinks, but more acute in the case of RCMs/2071-2100 scenario due to temperature raise which trigger shortening of the vegetation period coupled with water stress, especially during the flowering and yield formation interval (May-August).