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“World Food System —
A Contribution from Europe”

Use of Geographical Information Systems and Crop Simulator Models for Agriculture

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Abstract

Agriculture is highly sensitive to climate variability and weather extremes, such as droughts, floods and severe storms. According to previous studies, there will be an increase in the mean temperature in many regions in the world, and this will further affect other factors like rainfall and evapotranspiration, impacting agricultural productivity. The La Plata basin is located in South America and plays a very important role in local food security and world's food system supply. This region experienced an increase of 20 % to 30 % in annual precipitation during the last decades, creating favourable conditions to a huge expansion of agriculture, and several studies present a tendency of increase in precipitation during the next decades. However, while agriculture may benefit from a warmer climate and more precipitation, the increased potential of extreme events will pose challenges for farmers. Another very important issue is that the expected continuous increase in annual precipitation may not be compensated by increase in evapotranspiration.

In order to analyse the possible impacts of new climatic conditions, current cropping systems of major economic relevance for La Plata basin —corn, soybeans and wheat — will be studied and simulated with models using synthetic future climate scenarios. These models, combined in software packages like DSSAT and SUR, will couple information related to chemical and physical characteristics of soils, local past climate data such as radiation, precipitation and temperature, and phenological and genetic information of crops and management of systems. After simulation, calibration and validation of the performance of crops in current conditions, other simulations will be run with climate change forcing scenarios. As a result, the probabilities of crop performance in future scenarios will be interpolated on regional maps. This was already done for the North part of Buenos Aires Province using actual climate conditions, and will further be extrapolated to other regions of the La Plata basin and with future climate scenarios. Key features of this work are the possibility of simulating the effect of different environmental conditions, as well as to assess and compare the performance of different crops species, varieties and agricultural management strategies in La Plata basin.

Keywords: Agriculture, climate change, climate variability, crop modelling