78. Future climate change impacts on maize production in the Cerrado of Brazil

Silva Fernando Macena[1], Affholder François[2], Corbeels Marc[1,2]

[1]Embrapa-Cerrados, 73310-970, Planaltina, DF, Brazil

[2]CIRAD, Agroécologie et intensification durable des cultures annuelles, 34398 Montpellier, France

About 70% of Brazil's farm output is produced in the Cerrado region. The climate is sub-humid tropical, typical of the rather moister savanna regions of the world. Climate changes will have a severe impact on the agricultural sector in this region. A temperature increase of between 2 °C and 4 °C by the end of the century has been predicted. Model projections for future rainfall under high emission scenarios suggest a decrease of 20% to 40% of current values. The objective of this study is to assess the impact of climate change on maize yields in the Cerrado. To do so, we used the crop growth model STICS that was calibrated and tested against crop and soil data from an agronomic field trial at the experimental station of Embrapa Cerrados. The simulations covered present climate (1961-1990) and projections for the IPCC A1B emission scenario (2011-2050, 2051-2100). Climate change projections were generated using the Eta CCS regional climate model nested in the global model HadAM3P. Two systems were simulated: maize under conventional tillage and under no-tillage. We simulated water-limited yields for a typical local maize cultivar for 12 sowing dates and for two soil types, representing a scenario of low and high plant-available soil water storage capacity. STICS satisfactorily reproduced the growth and development of maize and the soil water dynamics of the experiment. Crop yields were highest under no-tillage. This cropping system uses most efficiently the seasonal rainfall as a result of reduced surface water run-off and soil evaporation, and also presents the greatest year-to-year yield stability. Future higher temperatures cause a significant decrease in the growing period of maize (an average of 20 days) leading to lower total biomass and grain production. Due to future decreased rainfall and increased risk of longer dry spells the sowing windows for optimal yields become smaller, especially under the conventional tillage system.