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“Development on the margin”

Estimating the Impact of Climate Change on Maize Yield and Planting Dates in Southern Brazil

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Abstract

Global warming and climate change are evident and widely accepted, while implications and extent of these factors are still in discussion. Climate is the most important input of agroecosystems, usually determining crop success or failure. For some regions of the world climate change will be manifested by increase in temperature and precipitation, although other will experience rainfall reduction. The aim of this work is to use a decision support system called SUR-INTA to estimate the impact of climate changes on maize production in N o-Me-Toque region, southern Brazil, within different planting dates (starting on August 2nd and every subsequent month until December 2nd, performing five planting dates). Using actual and past weather data (50 years), soil and crop responses to environmental factors, simulations were run to assess the performance of the decision support system. Once simulated values were compatible with observed crop data, synthetic series of weather with modifications suggested by several climate scenarios were run. For the study region, the same weather data had the minimum temperature increased by 0.3  C uniformly all over the years, and the precipitation increased by 10 % at each event. Even though it is impossible to predict if changes will occur uniformly, or in one season, this simulation is important to show the impacts of climate change on crops. As preliminary results, the mean maize yield was slightly higher in the future scenario due to an increase of water availability. Planting dates showed significant differences: under actual conditions the earliest planting dates pose a high risk of frost, potentially destroying the crop, with the best planting dates between October and December; for the future scenario, the best planting date was August, probably because of the reduction of frost risk and also due to better use of water, since atmospheric demand for water is not so high as in later planting dates. Very important information is that maize will have a shorter growing season due the increase of temperature, which leads to faster accumulation of degrees day and premature end of phenological stages. Although the crop reaches maturity faster, it will have less time to accumulate biomass or fill grains.

Keywords: Adaptation to climate change, decision support systems, future scenario