

47. Positive effect of climate change on cotton and rice in Africa and Madagascar

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The increase in temperature and in carbon dioxide as well as rainfall uncertainty associated with global warming could have serious consequences for crop production, especially for rainfed systems in Africa and Madagascar. It is therefore important to assess the potential impact of climate change on cotton and rice production for future climate change scenarios. We used DSSAT models, a set of process-based crop models, which can realistically simulate the main features of several crops such as cotton or rice. The models were calibrated and validated with data sets of observations made in farmers' fields and experimental stations in 2008 to 2011, with different cropping systems. Our main results show that climate change from 2005 to 2050 in North Cameroon or Madagascar will have a positive effect on both cotton and rice yields. The predicted increase of $0.05 \text{ }^\circ\text{C yr}^{-1}$ in temperature will shorten crop cycles by 0.1 to 0.2 d yr^{-1} with no negative effect on yields. Moreover, the fertilizing effect of CO_2 enrichment will increase yields by approximately 30 to 50 kg ha^{-1} . Our results are in discordance with the mainstream of pessimistic predictions for crop yields in Africa. The reason for this discrepancy comes from the specific conditions: in North Cameroon, some GCM predicts an increase in rainfall amount and in Madagascar Highlands, low temperatures are an important limiting factor for growth. Moreover cotton and rice have a metabolism for photosynthesis in C_3 . Thus they are more sensitive to carbon enrichment than C_4 crops (Maize, Sorghum...).