# Assessing the performance of dynamical and statistical downscaling techniques to simulate crop yield in West Africa

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## Abstract

Global circulation models (GCM) are increasingly capable of making relevant predictions of seasonal and long-term climate variability, thus improving prospects of predicting impact on crop yields. This is particularly important for semi-arid West Africa where climate variability and drought threaten food security. Translating GCM outputs into attainable crop yields is difficult because GCM grid boxes are of larger scale than the processes governing yield, involving partitioning of rain among runoff, evaporation, transpiration, drainage and storage at plot scale. It therefore requires the use of downscaling methods. This study analyzes the performance of both dynamical and statistical downscaling techniques in simulating crop yield at local scale. A detailed case study is conducted using historical weather data for Senegal, applied to the crop model SARRAH for simulating several tropical cereals (sorghum, millet, maize) at local scale. This control simulation is used as a benchmark to evaluate a set of Regional Climate Models (RCM) simulations, forced by ERA-Interim, from the ENSEMBLES project and a statistical downscaling method, the CDF-Transform, used to correct biases in RCM outputs. We first evaluate each climate variable that drives the simulated yield in the control simulation (radiation, rainfall, temperatures). We then simulate crop yields with RCM outputs (with or without applying the CDG-Transform) and evaluate the performance of each RCM in regards to crop yield simulations.

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