



Predominant decline in rainfed maize yield potential by 2055 under RCP8.5 in Sudano–Sahelian Cameroon

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Climate change represents a major threat to rainfed agriculture and food security, particularly in tropical regions that are highly dependent on the climate, especially rainfall. In sub-Saharan Africa, rising temperatures and increasing rainfall variability further exacerbate the vulnerability of agricultural systems. In the Sudano–Sahelian zone of Cameroon (>8° latitude), where maize (*Zea mays* L.) is a key staple crop, this strong climatic dependence exposes crop yields to pronounced interannual variability. In this context, assessing the future impacts of climate change using crop models driven by climate projections derived from IPCC scenarios is important for anticipating agricultural risks.

This study aims to produce gridded simulations of attainable maize yields under rainfed conditions and current management assumptions and under the RCP 8.5 climate scenario in the Sudano–Sahelian region of Cameroon for the period 2026–2055. To this end, the SARRA-Py crop model (DOI: 10.1051/cagri/2025018), designed for tropical agricultural systems, was calibrated using two complementary data sources. First, biophysical data from a field experiment conducted in Langui (Northern Cameroon) during the 2023 and 2024 growing seasons were used to define the intervals for parameter values for phenological stages, specific leaf area (SLA), and the potential yield coefficient. Second, Bayesian optimization of these parameters was performed with the objective of increasing the Pearson correlation coefficient between simulated yields and observed zonal yields (10 divisions × 24 years - 1999–2022 period) at the Sudano-Sahelian scale in Cameroon. Using these calibrated parameters, yield simulations were then forced by climate projections from an ensemble of ten corrected global and regional climate model combinations from the CORDEX-CORE framework (DOI: 10.5281/zenodo.17054199), adjusted using two bias-correction methods (CDF-t and ISIMIP) against rainfall observed through a regional rain gauge network (DOI: 10.5281/zenodo.11067784), and minimum and maximum temperature time series over the region derived from reanalysis datasets (DOI: 10.24381/cds.6c68c9bb). Temporal trends

in simulated yields were analysed using the Mann–Kendall trend test and Sen's slope estimator.

SARRA-Py satisfactorily reproduces the interannual and spatial variability of historically observed maize yields, with a significant correlation ($r = 0.6$; $p < 0.001$). Climate model projections then converge toward a prevailing decline in simulated maize yields across most of the Sudano-Sahelian zone of Cameroon over the 2026–2055 period under the RCP 8.5 scenario. Both bias-correction methods project annual yield reductions of approximately 1–2% per year in most of the southern and northeastern parts of the study area. The magnitude and spatial coherence of trends vary across the model ensemble, with ISIMIP generally showing more spatially homogeneous and slightly weaker negative signals than CDF-t. Overall, despite pronounced spatial heterogeneity, these projections indicate a deterioration of maize production potential and an increased vulnerability of rainfed agricultural systems under the considered scenario. These findings highlight the need for targeted adaptation strategies to enhance the resilience of agricultural systems in the Sudano-Sahelian of Cameroon.

Keywords : Northern Cameroon, RCP 8.5, SARRA-Py crop model, maize, yield; climate change