



## **Agricultural impacts of large-scale variability of the West African monsoon**

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Agriculture in the Sudano-Sahelian zone is heavily dependent on the seasonal characteristics of rainfall. This study seeks to characterise components of regional climatic variability and their impact on simulated, attainable, plot level yields of millet. First we describe at a regional scale two main events in the seasonal pattern of the monsoon over West Africa by using a daily rainfall dataset over the 1968-1990 period, that is, (i) the onset of the summer monsoon characterised by an abrupt northward shift of the ITCZ from 5°N to 10°N around 24 June, and (ii) large and coherent intra-seasonal rainfall fluctuations at two different time scales, around 15 days and 40 days. Second, we investigate the impact of these regional phenomena on local crop yields using SARRAH, a crop model simulating attainable yield, i.e. water and climate limited but not nutrient limited yield, by means of sensitivity analyses. The response of attainable yield to sowing date is studied for 19 years of the 1968-1990 period for a 90-day millet crop at Niamey. The results indicate that information on regional climate dynamics might help improve crop production locally. It is shown that the regional onset of the monsoon is very close to the ideal sowing date, derived from simulations, at Niamey and that simulated yields are much higher for these dates than for those identified with the traditional rule based on local rainfall. Taking into account the regional onset of monsoon thus seems to improve the relationship between water available and water used by the plant, and thus seems to potentially increase crop water use. Where attainable, simulated yields using the monsoon onset criterion are low, they are generally caused by intra-seasonal dry spells that have differential impact depending on phenological stage of the crop.