



Exploring agriculturally-relevant hydroclimatic characteristics in the Sahel

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Tropical drylands are global hotspots for malnutrition, poverty and water challenges. One such dryland region is the semi-arid Sahelian belt, where small-scale agriculture is the main source of food and income for the growing rural population. As agriculture in the region is almost exclusively rainfed and water is the main limiting resource for crop growth, food security is highly sensitive to precipitation. Although seasonal precipitation is generally sufficient, erratic and unreliable rainfall patterns combined with naturally low soil fertility make the agricultural systems extremely vulnerable. High hydroclimatic variability, reflected by e.g. frequent dry spells and recurrent droughts, is considered the most important factor affecting agricultural productivity in the Sahel and is therefore of particular interest. Previous studies in/covering the Sahel have primarily focused on individual cases (e.g. a handful of rain gauge stations within a relatively small region) or have been regional to global studies of a single phenomenon (e.g. drought occurrence). We advance the knowledge by examining the spatiotemporal variability and trends in a range of agriculturally-relevant hydroclimatic characteristics. Using 30 years of gridded precipitation and soil moisture data covering the whole Sahel region, we analyse agricultural water availability in various terms, including the amount and temporal distribution of rainfall, length of the rainy season and the occurrence of agriculturally relevant droughts and dry spells at crucial stages of crop growth. Furthermore, we discuss how the observed patterns and changes relate to insights on farmers' perception of risk of reduced yields or crop failures – and therefore feasibility of rainfed agriculture – and highlight some of the options farmers have to increase the capacity to cope with water shortages.