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A multi-index assessment of climate variability and agricultural drought in Afghanistan using station-observed historical data

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Abstract: Droughts have significantly affected Afghanistan's agricultural livelihood and food security in recent decades. Compared to other countries, a thorough analysis of the impacts of climate variability on agricultural drought is very limited. This study addresses this gap by analysing precipitation, temperature and agricultural drought indices in the Kabul River Basin (KRB), a significant food bowl of Afghanistan. We used 36 years (1980-2015) of historical data and investigated climate and agricultural drought indices. The agricultural standardised precipitation index (aSPI) and effective reconnaissance drought index (eRDI) were evaluated for three cropping seasons: rice, June-September; wheat, October-April; and maize, April-August. Results reveal fluctuations in temperature and precipitation indices without a clear annual pattern. Notably, multi-year drought events have become more frequent and intense after 2000. During the rice growing season, 72% of the observation stations consistently recorded favourable ('moderately wet') conditions for rainfed farming. However, most of the basin became drier during the wheat season. 'Severe' to 'extreme' drought conditions were observed in the dry season (October-May), while 'normal' to 'mildly wet' conditions prevailed during the monsoon season (June-September). Furthermore, changes in rainfall patterns and evapotranspiration could adversely impact groundwater recharge, a critical water source for the population. These research findings provide a scientific basis for developing a drought management plan and decision-making in Afghanistan. Moreover, the assessment method is conveniently applicable elsewhere, particularly for countries with low rainfall.

Keywords: *Keywords: Agriculture; Drought; Afghanistan; Kabul River Basin; Climate Indices; Agricultural Standardised Precipitation Index and Effective Reconnaissance Drought Index*