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Water sustainability of South African crop production under current and future climatic conditions

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South Africa is a water scarce country, with 98% of available water resources already allocated. In addition, only 12% of the land is considered suitable for growing rainfed crops, making commercial agriculture production heavily dependent on irrigation. Current climate projections suggest that South Africa will experience increased frequency of drought events over the next century. This will have notable implications for food security, especially in rural communities that still depend on rainfed production for their livelihoods. In this work, we evaluate water sustainability for seventeen major crops produced in South Africa under current climatic and management conditions as well as under future climate scenarios. We map the spatial distribution of source- and crop-specific water use, and asses their sustainability in terms of water debt repayment time (i.e., the time needed to renew water resources used for annual crop production). We find high water debts in the Western and Eastern Cape regions, revealing unsustainable production due to irrigation in arid areas. Results from climate change scenarios suggest an intensification of such pressure on water resources and allow us to identify crop types and locations where production is likely to be more (or less) sustainable under future climatic conditions, a key step to informing land use planning decisions.