Water yield and biomass production for on a eucalypt-dominated Mediterranean catchment under different climate scenarios

João Rocha, Ana Quintela, Dalila Serpa, Jan Jacob Keizer e Sérgio Fabres

Journal of Forestry Research, Volume 34, pages 1263–1278,
DOI: 10.1007/s11676-022-01590-2
Publication Date (Web): January 02, 2023

Abstract

Worldwide, forests are vital in the regulation of the water cycle regulation and in water balance allocation. Knowledge of ecohydrological responses of production forests is essential to support management strategies, especially where water is already scarce. Shifting climatological patterns are expected to impact thermopluviometric regimes, water cycle components, hydrological responses, and plant physiology, evapotranspiration rates, crop productivity and land management operations. This work (1) assessed the impacts of different predicted climate conditions on water yield; (2) inferred the impacts of climate change on biomass production on eucalypt-to-eucalypt succession. To this end, the widely accepted Soil and Water Assessment Tool (SWAT) was run with the RCA, HIRHAM5 and RACMO climate models for two emission scenarios (RCP 4.5 and 8.5). Three 12-year periods were considered to simulate tree growth under coppice regime. The results revealed an overall reduction in streamflow and water yield in the catchment in line with the projected reduction in total annual precipitation. Moreover, HIRHAM5 and RACMO models forecast a slight shift in seasonal streamflow of up to 2 months (for 2024–2048) in line with the projected increase in precipitation from May to September. For biomass production, the extreme climate model (RCA) and severe emission scenario (RCP 8.5) predicted a decrease up to 46%. However, in the less extreme and more-correlated (with actual catchment climate conditions) climate models (RACMO and HIRHAM5) and in the less extreme emission scenario (RCP 4.5), biomass production increased (up to 20%), and the growth cycle was slightly reduced. SWAT was proven to be a valuable tool to assess climate change impacts on a eucalypt-dominated catchment and is a suitable decision-support tool for forest managers.