



Climate change in chestnut producing regions in Portugal

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The chestnut trees are well adapted to temperate and humid climates, with moderate annual thermal contrast and without long and severe summer droughts. Bioclimatic studies suggest that chestnut trees have special needs, including at least six months with average monthly air temperature above 10 °C, total annual precipitation of 800 – 900 mm, and 25% of annual precipitation in summer. Weather is also determinant in the phenology of the species. For example, the suitable average air temperature range is: 13 – 15°C to initiate the phenological activity, 18 – 20°C for flowering, and 20 – 22°C for maturation. Therefore chestnut production is highly affected by adverse weather conditions and can be severely reduced by the occurrence of extreme weather/climate extremes: late frosts, heat waves, heavy rainfall, wind gusts, maximum air temperature lower than 25°C during flowering or above 32°C, which cause thermoinhibition of vegetative activity. Thus, it is important to characterize the chestnut producing regions in present and future climate and estimate how, when and where the weather conditions will be maintained or changed. For this study we used meteorological data from ERA5 for the 1981 – 2010 period and several GCM-RCM simulations from CORDEX Bias-adjusted RCM data for 2011 – 2100 period to assess the climate for current and two future scenarios (RCP 4.5 and RCP 8.5). The meteorological variables selected for this study have been identified in previous studies as having the greatest influence in the phenological activity of the chestnut tree and on the chestnut productivity. The results include the identification of the regions where: (i) the variables will have significantly different statistical distributions in the future; (ii) will be necessary to adopt hazard risk management and climate adaptation measures, including substitution by other varieties more adapted to future conditions or the development of genetic improvement programs; and, (iii) the identification of new production areas.