EGU22-7581
https://doi.org/10.5194/egusphere-egu22-7581
EGU General Assembly 2022

Impact of climate change on bioclimatic zoning of chestnut trees in Portugal

Teresa Raquel Freitas[1], João A. Santos[2], Ana P. Silva[3], and Hélder Fraga[4]
[1]University of Trás-os-Montes e Alto Douro (UTAD), Research Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), Vila Real, Portugal (trfreitas@utad.pt)
[2]University of Trás-os-Montes e Alto Douro (UTAD), Research Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), Vila Real, Portugal (jsantos@utad.pt)
[3]University of Trás-os-Montes e Alto Douro (UTAD), Research Centre for Agricultural Sciences and Engineering, Vila Real, Portugal (asilva@utad.pt)
[4]University of Trás-os-Montes e Alto Douro (UTAD), Research Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), Vila Real, Portugal (hfraga@utad.pt)

Chestnut tree cultivation is largely spread worldwide, with approximately 596 × 103 ha devoted to fruit production, raising global production to approximately 2.5 million t, with an upward trend of 56 × 103 t per year. In the European Union, Portugal is the largest chestnut producer (38,870 ha). In ecent years, the country has shown an increasing trend of 723 ha per year, and the production was 35,830 t in 2019, but largely concentrated in the northeast. In the present study, bioclimatic indices are applied to analyse the spatial distribution of chestnut trees in mainland Portugal, namely degree days (suitability interval: 1900–2400ºD), annual mean temperature (8–15ºC), monthly mean maximum temperature <32ºC, and annual precipitation (600–1600 mm). These indices are assessed for both historical (1989–2005, from IBERIA01) and future (from EURO-CORDEX) climates, within three sub periods: 2021–2041, 2041–2060, and 2061–2080, and under two anthropogenic radiative forcing pathways (RCP4.5 and RCP8.5). For the historical period, in terms of degree days, the suitability for chestnut tree cultivation (i.e., percentage of years fulfilling the predefined interval) is 10% in southern Portugal, whereas much higher values are found at high elevations in the north (50–90%). For the annual mean temperature, most of northern Portugal shows almost 100% suitability. Concerning the maximum temperature, the suitability reduces from the west (100–90%) to the east (40%). Regarding the annual precipitation, the suitability is heterogeneous throughout the territory, with areas under 50%. A compound index is also defined, revealing suitability from 100 to 75% over northern Portugal, while central and southern Portugal show values in the approximate range of 25–50%. For future climates, a progressive and significant reduction in suitability was found, particularly for RCP8.5 and in the long-term period. Therefore, climatic changes embody an important threat to chestnut tree cultivation in Portugal, potentially affecting the plant physiology and phenology, ultimately leading to a reduction of the cultivation areas and yield. Adaptation strategies are critical to mitigate climate change detrimental impacts. It is indeed essential to implement measures that promote chestnut orchards' adaptive capacity, reducing vulnerability and risks of exposure to increasingly warm and dry climates, but also warranting the sustainability of the sector.

Acknowledgments: The work is financed by the CoaClimateRisk project (COA/CAC/0030/2019) financed by the Portuguese Foundation for Science and Technology (FCT).