Abstract

A Spatial Analysis of Wildfire Risk Factors in Agroforestry Areas under Climate Change: A Case Study from Monte Pisanu, Sardinia (Italy) †

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In recent years, wildfires of unprecedented scale and duration have occurred in different regions of the world, a phenomenon that is expected to be exacerbated by climate change.

Although burned areas generally decreased in the Mediterranean basin in recent decades, a current increase in extreme wildfire events represents a potential threat to human and natural systems. Since scholars have highlighted the potential of agroforestry (AF) systems in contributing to a fire risk reduction in Mediterranean environments, this study aimed to examine whether lower wildfire risk factors could be found in AF areas under simulated climate change conditions.

Fire behaviour simulations were performed on FlamMap using historical (1996–2005) and simulated climate data (2036–2045 and 2066–2075) from a Euro-CORDEX regional climate model and two climate change scenarios (RCP4.5 and RCP8.5). Burn probability, conditional flame length and fire size were simulated in the Monte Pisanu forest, central Sardinia (Italy).

Extreme fire risk days were defined as days exceeding the 95th percentile of the fire weather index (FWI) and used to assess future changes in seasonal burn probability (SBP). A spatial analysis (QGIS) of simulated outputs was performed to compare agroforestry areas to other natural or seminatural areas.

The results showed that wildfire risk factors in agroforestry areas were generally lower than in shrublands and forests. However, results were highly dependent on the input parameters, specifically wind direction, ignition patterns and climate change scenarios, limiting the final assessment of SBP in agroforestry areas. Nevertheless, lower values of SBP were found in agroforestry areas under low-risk climate change scenarios, suggesting that higher efforts for climate change mitigation might enhance the efficacy of agroforestry systems in reducing the wildfire risk at Monte Pisanu.

In conclusion, an efficient fire reduction in central Sardinia might depend on the integration of agroforestry areas into wildfire management planning and strategies for climate change mitigation and adaptation.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Publicly available datasets were analyzed in this study. Land cover data can be found here: http://www.sardegnageoportale.it/index.php?xsl=2420&s=40&v=9&c=14480&es=6603&na=1&n=100&esp=1&tb=14401. Data for climate change scenarios can be found here: https://esgf-node.ipsl.upmc.fr/search/cordex-ipsl/.

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