IMPACT OF CLIMATE CHANGES ON EUCALYPT PRODUCTIVITY IN PORTUGAL IN THE LAST 20 YEARS

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ABSTRACT

Changes in climate, as the anomalies observed in temperature and rainfall, more frequent extreme events such as extended droughts or longer heat wave spells, are already causing considerable economic and environmental impacts including possible losses in forest plantation, especially in areas where water is already a significant limiting factor for growth.

The aim of this study was to quantify the expected losses in growth of eucalyptus forest plantations in Portugal, as a result of climate changes experienced in the last 20 years (2000-2020), as compared with the historical climate normals of 1970-2000.

The impact on growth between the two periods was based on well-established empirical relationships between mean annual increments and climate (namely total rainfall, summer rainfall, average temperature, minimum and maximum temperature and number of days with rain).

The last 20 years of climate records showed a clear increase in warmer and drier conditions. More than 90% of the years had weather conditions which would be expected to worsen the growth of plantation, due to a lower annual precipitations and longer dry periods with less rainy days and a higher mean and maximum temperatures, compared with historical averages (viz 1970-2000 period). In the two worst years, 2005 and 2012, almost 80% of the eucalypt forest areas did not meet the minimum climatic requirements for *E.globulus* growth. As a result, many areas resulted in a deterioration of its site indices, with an overall reduction in plantation productivity estimated to be around 20%, relative to historical values.

Although there has also been a significant reduction in areas affected by extreme cold winter conditions (a 35% drop in the total area affected), in most cases, there was still a loss of growth due to overall drier conditions throughout the growing cycle.

These results highlight the need to adopt proper adaptive silvicultural strategies, better plant varieties and tighter control of pests and diseases associated with these climate-related stress events, hence ensuring plantation remains a sustainable and attractive investment.

Keywords: Climate change, climate characterization, eucalyptus, productivity.