30th Conference 27-31 October Asic 2025 | Lisbon, PORTUGAL Rectory of the University of Lisbon

IAC INSTITUTO AGRONÔMICO

33637

Study of climate change in coffee growing regions, São Paulo- Brazil

PRELA-PANTANO, A., BLAIN, G.C., SILVEIRA, J.M.C.; ALMEIDA, J.A.S., ROCHA, H.R., MENDONÇA, C.A.
Instituto Agronômico – SAA/SP/Brazil - angelica.pantano@sp.gov.br

Introduction

Coffee farming plays a significant role in the global economy and serves as a vital source of livelihood for smallholder farmers in many regions worldwide. In Brazil, Coffea arabica accounts for approximately 80% of the cultivated coffee area. However, production levels vary due to physiological factors and adverse environmental conditions, such as drought and high temperatures, which directly affect crop yields (Embrapa Café, 2021).

Given that coffee growth and productivity are strongly influenced by climatic conditions, this study aims to analyze climate changes in two key coffee-producing regions in the state of São Paulo, Brazil: Franca and Mococa.

Materials/Methods

To characterize the current climate (2001–2020), data from the Brazilian Daily Weather Gridded Data (BR-DWGD) database developed by Xavier et al. (2022) were utilized. For future climate projections, the study employed data from *The Climate Change Dataset for Brazil (CLIMBra)*, available at https://www.scidb.cn/en/detail?dataSetId=609b7ff93f0d4d1a9ba6eb709027c6ad (Ballarin et al., 2024).

Two future scenarios for 2031–2060 were considered: SSP2-4.5, representing an optimistic pathway, and SSP5-8.5, representing a pessimistic scenario. Potential evapotranspiration was estimated using the Hargreaves and Samani (1985) method.

Results/Discussion

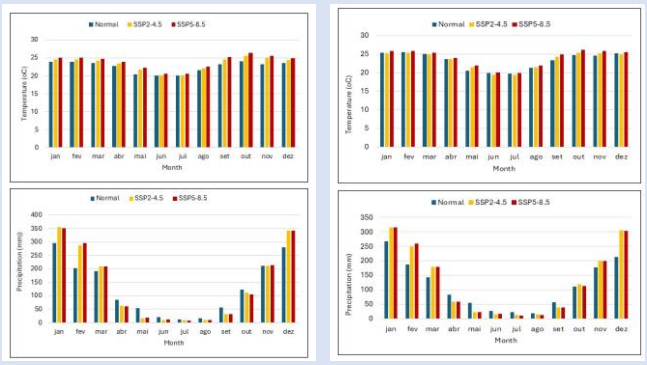

Figure 1 - Temperature (o C) and Precipitation (mm), climatological normal, scenario 1 and scenario 2, for Franca (a) and Mococa (b), SP, Brazil.

For the two locations analyzed, Franca and Mococa, it was observed that in both scenarios tested (SSP2-4.5 and SSP5-8.5) there will be an increase in temperature in all months, being greater in scenario 2.

However, scenario 2 indicates an even greater increase, if there are no changes in human activities capable of containing climate change.

Regarding precipitation, it was also observed that in both locations there will be variation in both scenarios, however the volumes tend to decrease in the autumn and winter period (between April and September), a period in which there may also be an increase in temperatures.

However, there may be an increase in precipitation between December and March, accompanying the rise in temperatures.

Conclusion/Perspectives

- The results indicated an increase in average temperatures all months at both locations. In Franca, the projected annual average temperature increases were 0.8°C under and 1.3°C under. In Mococa, increases were 0.1°C and 0.7°C. Precipitation seasonal shift leads to a significant reduction in the monthly balance between rainfall and evapotranspiration, with negative deviations of -161 mm and -188 mm in Franca, and -107 mm and -130 mm in Mococa, under the SSP2-4.5 and SSP5-8.5 scenarios, respectively.

- Both scenarios indicate climate changes affecting temperatures and rainfall in these regions.

References:

HARGREAVES, G. H.; SAMANI, Z. A. Reference crop evapotranspiration from temperature. Applied Engineering in Agriculture, v. 01, n. 02, p. 96-99, 1985.