



# Agroclimatic suitability of the Coffee Arabica (Coffea arabica L) considering climate change scenarios

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### **OBJECTIVES**

Climate change and its effects represent a serious challenge to all activities, both social and those related to the productive sector. It is also worth noting that agriculture is one of the elements most affected by climate oscillations and variability, and is one of the activities most affected by this anomaly. Arabica coffee is essential to the economy of various countries, but its development is highly affected by climate characteristics and variability (Paes de Camargo, et.al, 1973). Another essential aspect that must be considered in the future definition of viable areas is the possible climate scenarios in light of the indications for different regimes. In this regard, a study was developed considering the climate conditions based on the 1961-1990 climatological standards, according to the database existing in the Agronomic Institute-Campinas. The study considered the average annual temperature and total annual rainfall conditions to define the agroclimatic areas and the climate requirements (Paes de Camargo et al; 1973). The study considered the possible climate scenarios, with patterns based on climatological normal, and establishing warming patterns of 2 to 4°C and variation in the total annual rainfall of plus or minus 20%.

## **CLIMATE REQUIREMENTS - ARABICA COFFEE**

It is a crop with low tolerance to frost and even high temperatures. Annual temperatures between 18°C and 22°C are fully favorable, while temperatures between 18 and 20°C may present restrictions closer to 18°C due to delayed vegetative cycle and ripening. Temperatures below 18°C may be considered unfavorable due to the increased risk of frost. Annual temperatures between 22°C and 24°C indicate a range at risk of high maximum temperatures. The closer to 24°C, the more appropriate agronomic techniques should be used. Regarding rainfall distribution, although the crop requires a dry period for fruit maturation and harvesting, the resulting rest period and pre-induction of flowering can be quantified by annual water deficit. Regions with zero annual water deficit cause problems with maturation, harvesting, and plant health. On the other hand, an annual water deficit between 160 and 240 mm may indicate regions where supplemental irrigation is necessary. With annual water deficits above 240 mm, irrigation is essential.

### Agroclimatic limits and crop development Thermal limits and agroclimatic Water limits and agroclimatic suitability suitability t\_cafe arabica Water Deficiency Arabica coffee 17-18 < 200mm Apta Inapta 18-19 200 a 240mm Marginal Inapta 19-20 Marginal 240 a 300mm Inapta 20-21 300 a 400mm Inapta Apta 21-22 400 a 600mm Apta Inapta 22-23 600 a 800mm Apta Inapta Marginal 23-24 > 800mm Inapta >24 Inapta t+2 t\_cafe arabica 19-20 Marginal 20-21 Apta 21-22 Apta 22-23 Apta 23-24 Apta com restrições

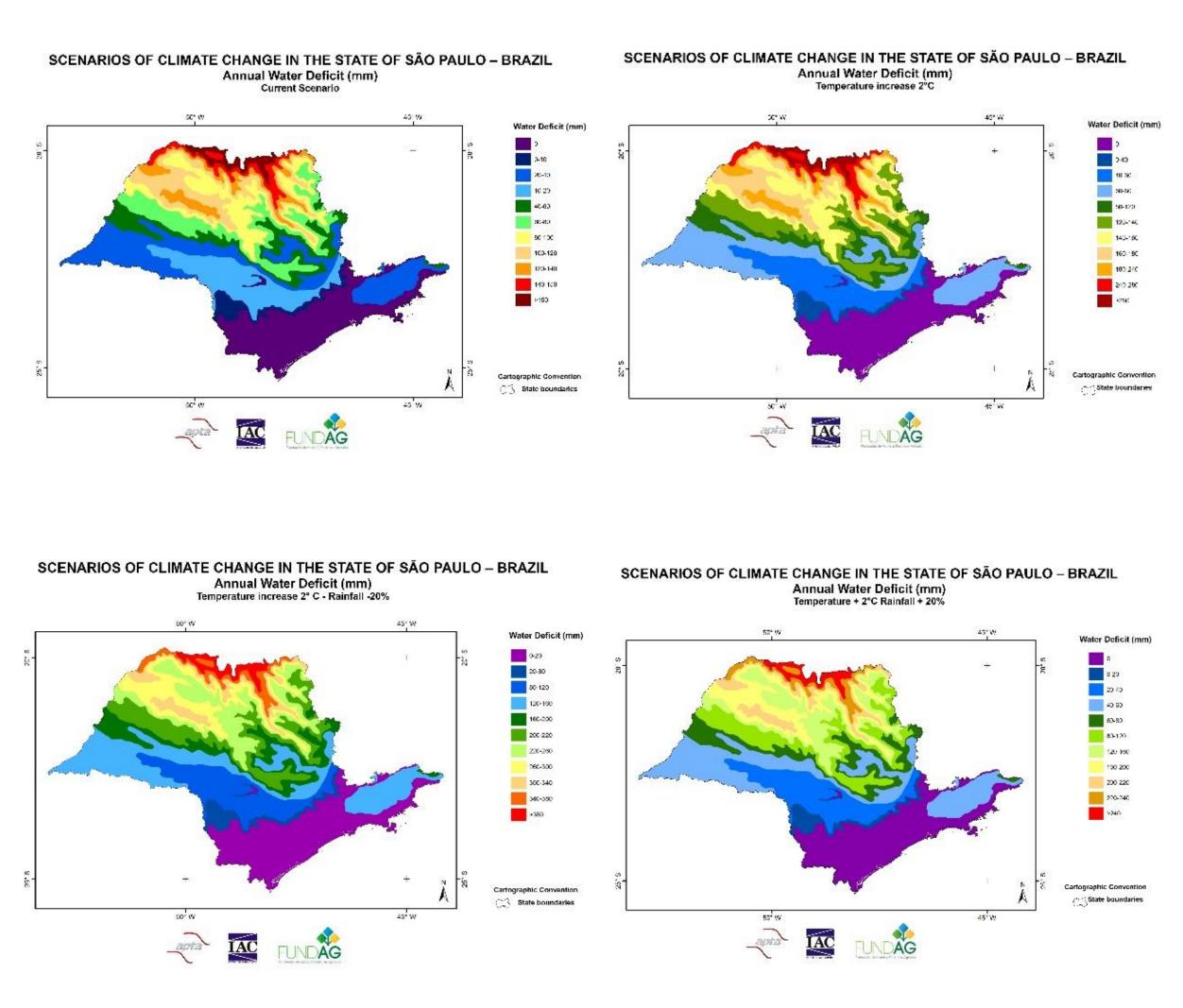


Figure 2. Estimated water deficits for 4 climate scenarios.

### SCENARIOS OF CLIMATE CHANGE IN THE STATE OF SÃO PAULO – BRAZIL Mean Annual Temperature and Projected Values

**RESULTS** 

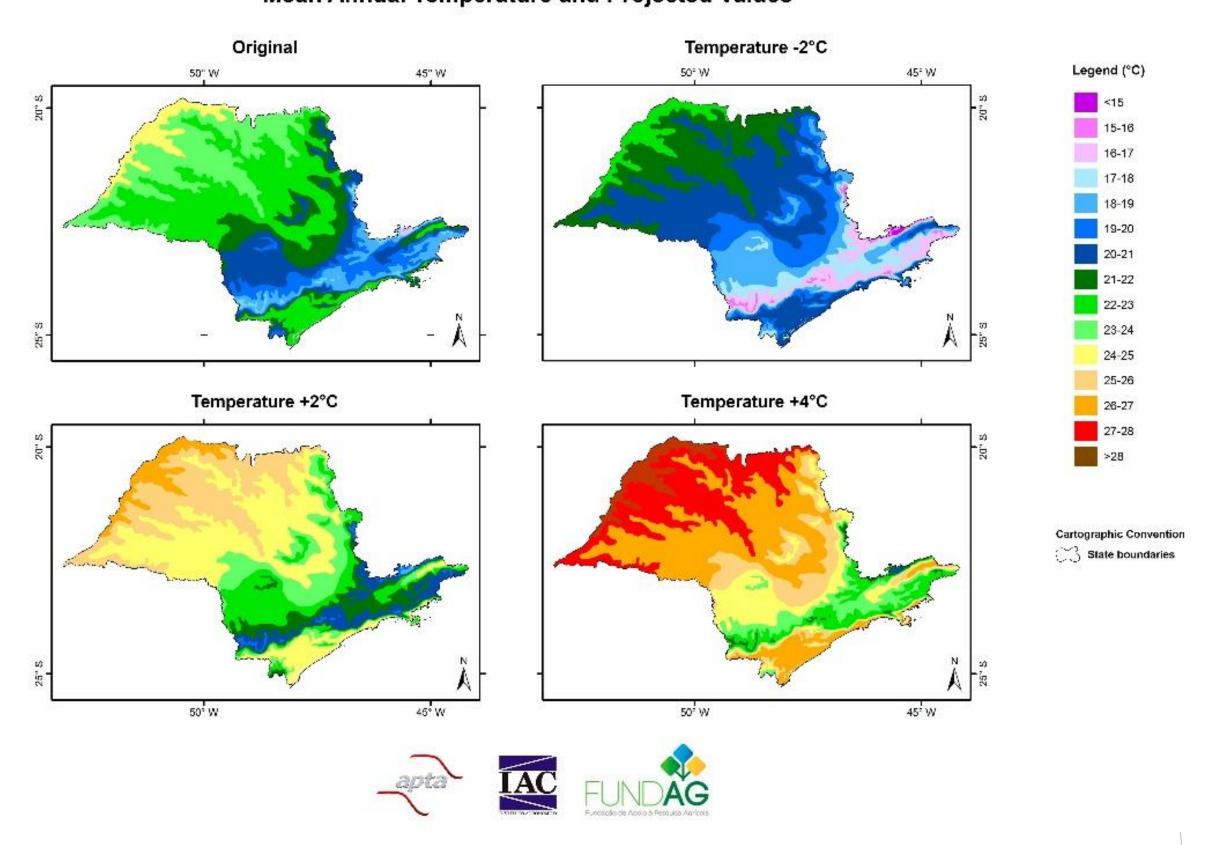


Figure 1. Actual and estimated values of mean annual air temperature.

# SCENARIOS OF CLIMATE CHANGE IN THE STATE OF SÃO PAULO – BRAZIL Arabica Coffee Adaptation - Normal Values Bioclimatic Zones Suitable Warginat to evaluable Warginat Warginat to evaluable Warginat to

ADAPTABILITY OF ARABICA COFFEE

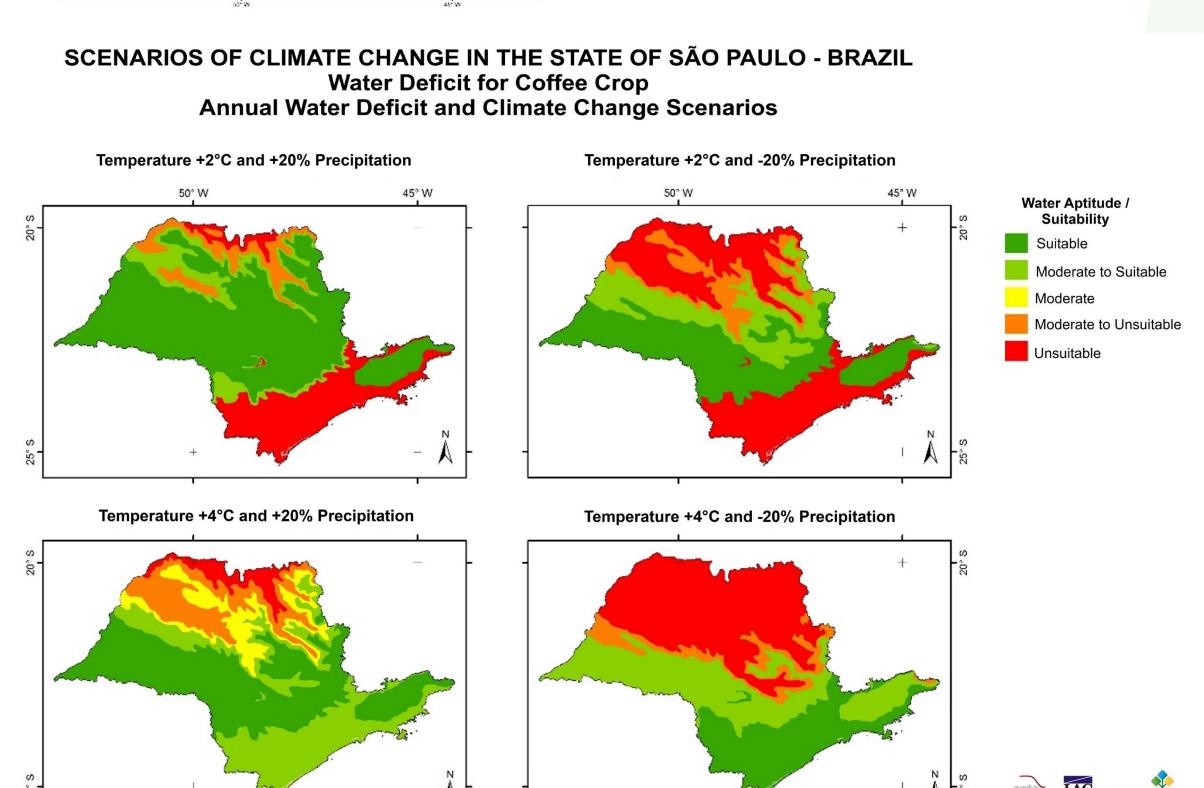


Figure 3. Bioclimatic zones for Arabica coffee and climate change scenarios.

# FINAL CONSIDERATIONS

The study considered the possible climate scenarios, with patterns based on climatological normal, and establishing warming patterns of 2 to 4°C and variation in the total annual rainfall of plus or minus 20%. The results indicate that in relation to the current climate scenario, the potential agroclimatic area in the state (Figure 2) remains high. However, compared to the scenarios established with an increase of 2°C the bioclimatic zones are very high with the decrease in rainfall, there is a significant reduction in the suitable area. In the scenario of warming of 2°C, as well as at 4°C increase. Maintaining the current rainfall regime even with a 20% increase in rainfall, the suitable areas remain high. However, if there is a 20% reduction in the total rainfall, the area suitable for cultivation is significantly reduced. It is therefore concluded that the thermal regime of +4°C poses serious restrictions to this crop, requiring genetic adaptations and reducing precipitation is a crucial factor for crop management.

# References

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