



Climate Change in the São Francisco Valley: Impacts and Socio-Environmental Adaptation Strategies

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Summary

Climate change represents one of the greatest global challenges of the 21st century, with direct impacts on ecosystems, agriculture, and water security. In the Brazilian semiarid region, especially in the São Francisco Valley, these effects are intensified due to the region's climate fragility and its dependence on irrigated agriculture. This article analyzes the main impacts of climate change on the São Francisco Valley, highlighting changes in rainfall patterns, increased temperatures, and...

Keywords: Climate change; Semi-arid region; São Francisco Valley; Irrigated agriculture; Adaptation.

Abstract

Climate change represents one of the greatest global challenges of the 21st century, with direct impacts on ecosystems, agriculture, and water security. In the Brazilian semiarid region, especially in the São Francisco Valley, these effects are intensified due to the region's climate fragility and its dependence on irrigated agriculture. This article analyzes the main impacts of climate change on the São Francisco Valley, highlighting changes in rainfall patterns, increased temperatures, and the impact of climate change on the São Francisco Valley.

Keywords: Climate change; semiarid region; San Francisco Valley; irrigated agriculture; adaptation.

1. Introduction

Climate change has profoundly altered environmental and social dynamics in different regions of the world. In Brazil, the impacts are heterogeneous, but particularly intense in the Semi-arid region, where water vulnerability and dependence on agriculture make the effects more noticeable (Marengo, 2014).

The São Francisco Valley, a strategic hub for irrigated and responsible agricultural production for a significant portion of Brazilian export fruit production, is located in the center of these transformations. The increase in temperature, the variability of rainfall patterns and

extreme weather events pose direct threats to the sustainability of agricultural production and socio-environmental balance of the region (Embrapa, 2020).

Therefore, this article seeks to answer the following question: what are the main impacts of climate change in the São Francisco Valley and what strategies can be adopted for socio-environmental adaptation?

2. Theoretical Framework

2.1 Climate change and its effects in the Semi-Arid region

IPCC studies (2021) indicate that the Northeast Semi-Arid region is already experiencing increases in temperatures above the global average and a significant reduction in rainfall regularity. This combination aggravates desertification, water scarcity and food insecurity.

2.2 Irrigated agriculture and climate vulnerability

The São Francisco Valley is highly dependent on irrigation, which increases its vulnerability to reduced water availability. Changes in the river regime of the São Francisco, combined with competition for water, could jeopardize the continuity of the productive model based on large irrigated perimeters.

2.3 Socio-environmental adaptation

The literature indicates that adaptation practices include: efficient use of water, productive diversification, integration of agroecological practices and strengthening of water and territorial governance (Altieri, 2012; Gliessman, 2015).

3. Methodology

The research is qualitative and exploratory, based on bibliographic review and analysis of documentary. Reports from Embrapa Semiárido, the National Agency for

Águas (ANA), in addition to scientific articles published in indexed journals (Scopus, SciELO and Web of Science). The analysis followed the thematic content analysis technique (Bardin, 2011), categorizing impacts and adaptation strategies.

4. Results and Discussion

4.1 Impacts observed in the São Francisco Valley

- Increase in average temperature: growth of more than 1.2°C in recent decades, affecting production cycles.
- Reduction in the regularity of rainfall: greater unpredictability, making it difficult planning agricultural.
- Extreme events: prolonged droughts and localized floods, compromising the irrigation infrastructure.
- Irrigated agriculture at risk: pressure on the use of water from the São Francisco River, with disputes between energy generation, human supply and agricultural production.

4.2 Adaptation and mitigation strategies

- Smart irrigation technologies: sensors, drip irrigation and use of renewable energy.
- Agroecological practices: crop diversification, production consortia and recovery of degraded soils.
- Water governance: strengthening river basin committees, planning participatory territorial.
- Public policies and innovation: expansion of PRONAF, sustainable rural credit and integration with innovation ecosystems.

5. Conclusion

Climate change poses a concrete threat to the sustainability of the Rio Grande do Sul Valley. San Francisco, demanding articulated responses that combine technology, policies public policies and social participation. Irrigated fruit farming, although highly efficient,



depends on innovative adaptation strategies to maintain its competitiveness in climate uncertainty scenario.

The integration between technological innovation and agroecological practices emerges as a path promising, allowing coexistence with the Semiarid region in a sustainable manner. In addition Furthermore, water and territorial governance must be strengthened to ensure justice social, efficient use of natural resources and resilience to climate change.

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