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Methodological contribution to the mapping of environmental susceptibility to soil salinization in dry regions

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Introduction

The process of soil salinization is the result of environmental characteristics and/or anthropogenic actions, being responsible for the degradation of thousands of hectares of soils in semiarid and arid regions, resulting in wasting in agricultural production (Sahab et al., 2021; Wei et al., 2021). In the Brazilian semiarid region, hundreds of hectares of land affected by the salinization process. Mapping areas susceptible to salinization can prevent soil loss due to the accumulation of salts. In this context, the aim of this study is to present a methodology for mapping the environmental susceptibility to salinization of soils in semiarid regions.

Study area

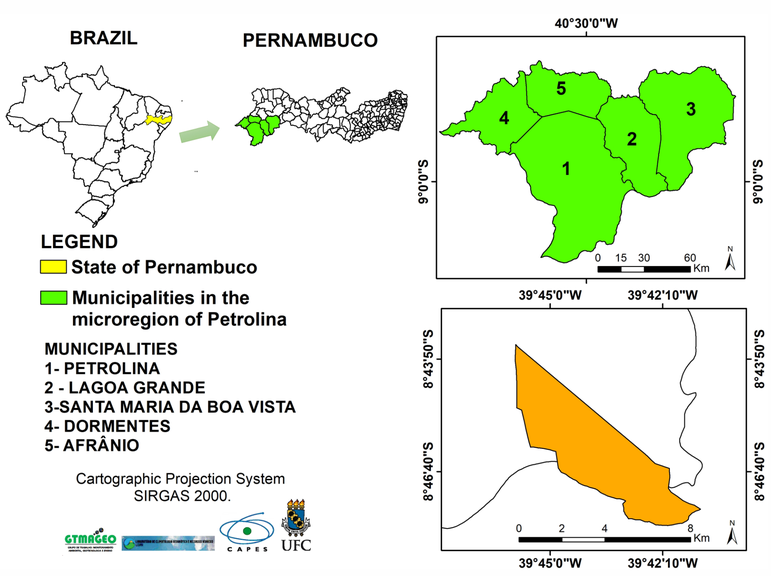
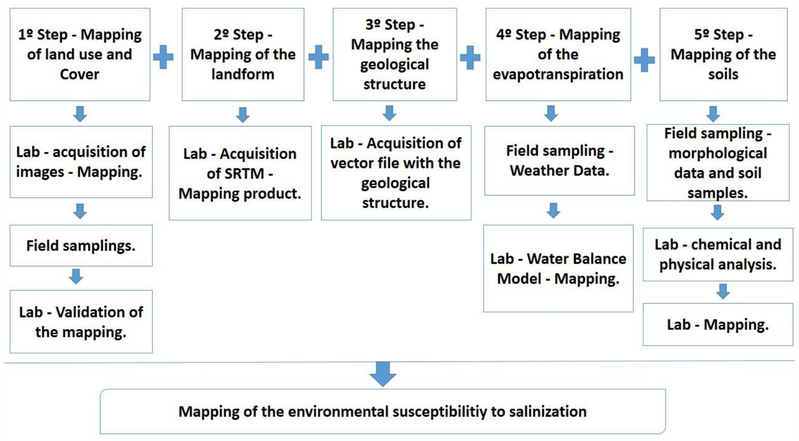


Figure 1: Location of the study areas (Municipalities of the Microregion of Petrolina and Quilombola Community of Cupira in Santa Maria da Boa Vista) - Pernambuco - Brazil

Methodology

Mapping base



Structure of the model used to map susceptibility to soil salinization

$$SCP_S = \frac{[(UT \times 2) + (S \times 2) + R + EG + E]}{5}$$

Where: *SCPs* represents the environmental susceptibility of lands to salinization; *UT* represents the use and occupation of lands; *S* represents the structure of the soils; *R* is the relief structure; *EG* is the geological structure and *E* represents evapotranspiration.

Field soil collection

Soil profiles → 32 profiles → 0-30cm profiles

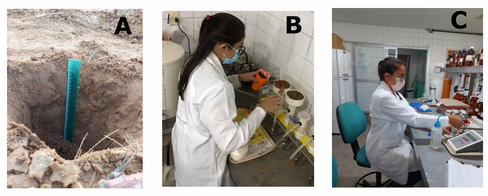


Figure 1: (A) Soil collection in the 30cm profile;(B) Preparation of soil samples in the laboratory;(C) EC analysis

Chemical analysis of soils in the laboratory

EC (Electric Conductivity) + ESP (Exchangeable Sodium Percentage)

Statistical analysis

Test of normality → Shapiro-Wilk and Anderson-Darling (α = 0,05)

Statistical correlation (Pearson)

Results and Discussion

❖ Statistical analysis (Statistical analysis):

Shapiro-Wilk = 0,33

Anderson-Darling = 0,41

Normality

❖ Panorama for area 1 – Cupira

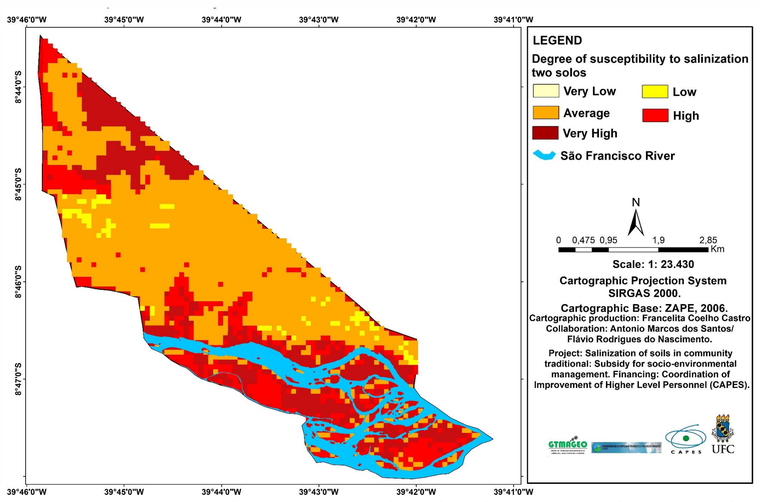


Figure 2: Chart of susceptibility to salinization of the Quilombola de Cupira Community - Santa Maria da Boa Vista – Pernambuco - Brazil

Table 1: Salinization susceptibility classes, area of occupation and main determining factors for each class (Quilombola de Cupira Community)

Degrees of Susceptibility to Salinization	Occupied zone (%)	Main driving factors
Very Low	0	---
Low	2.72	Wavy and strong-wavy relief + Leptsols + closed Caatinga and open Caatinga
Average	59.71	Flat and smooth-wavy relief + closed caatinga + Leptsols
High	15.72	Open Caatinga + Fluvisols
Very High	21.84	Solonetz + irrigated agriculture + flat relief

❖ Panorama for area 2 – municipalities in the Microregion of Petrolina

Table 2: susceptibility classes, area of occupation and Salinization main determining factors for each class (municipalities in the Microregion of Petrolina)

Degrees of Susceptibility to Salinization	Occupied zone (%)	Main driving factors
Very Low	1.4	Ferralsols + closed caatinga + flat relief
Low	17.5	Ferralsols + rainfed agriculture + Exposed soil
Average	47.5	Acrisols + rainfed agriculture + Exposed soil + Open Caatinga
High	30.6	irrigated agriculture + flat relief + Acrisols
Very High	3	Solonetz + Vertisols +irrigated agriculture + flat relief

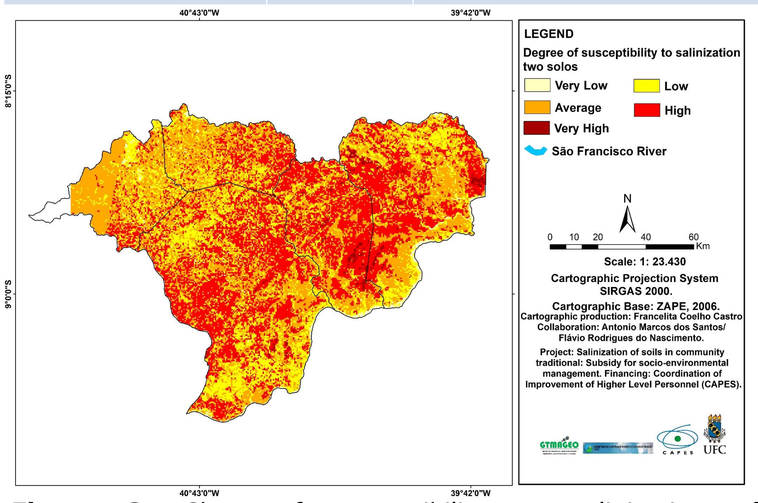


Figure 3: Chart of susceptibility to salinization of municipalities in the Microregion of Petrolina - Pernambuco - Brazil

Conclusions

The methodology proposed and used to analyze the susceptibility to salinization is easy to apply and could map the reality of semiarid lands regarding the process of salt accumulation.

References

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