Food and Agriculture Organization of the United Nations

Managing salt-affected soils for sustainable future

2nd Meeting of the International Network of Salt-Affected Soils (INSAS)

International Network of Salt-Affected Soils

| **Hybrid** meeting
| Tashkent/Nukus, **Uzbekistan**
| **May 22-26**, 2023

GLOBAL SOIL PARTNERSHIP

Monitoring salt affected soils by NIR spectroscopy in the Colombian Caribbean banana plantations.

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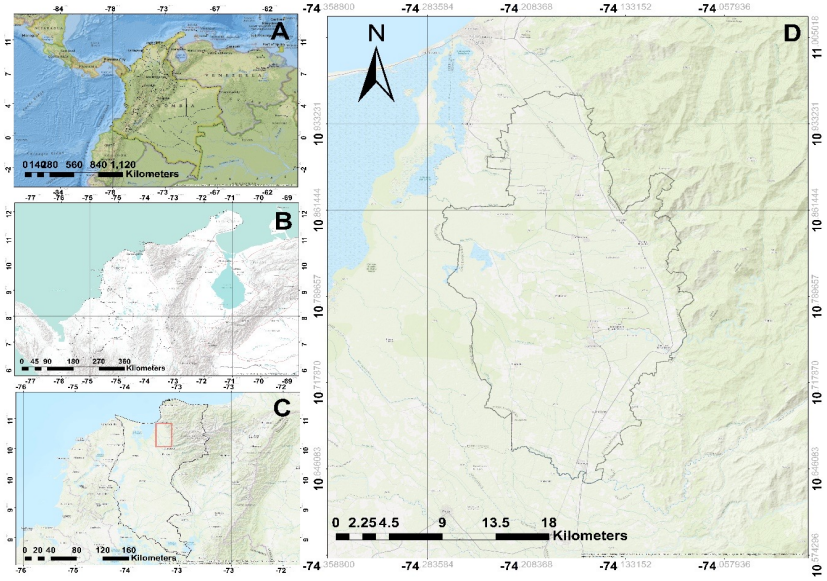
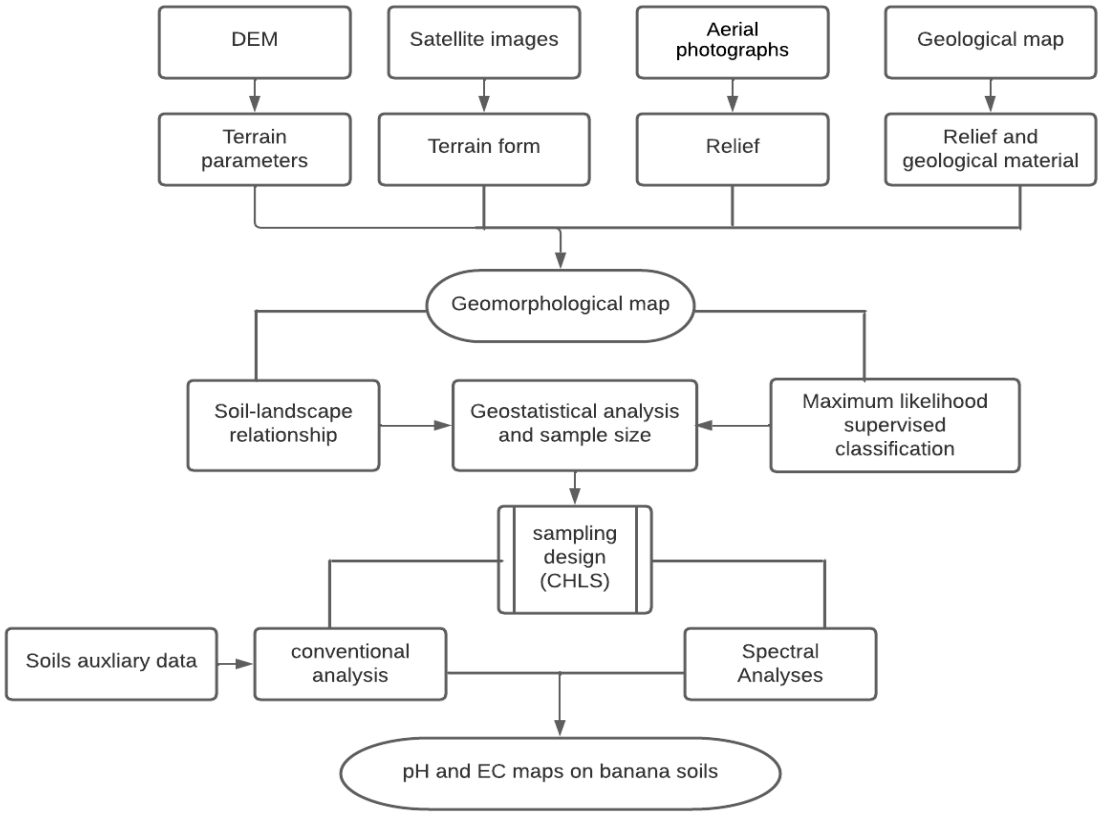
Introduction

- ✓ Colombia has more than 14 million of hectares affected by salts.
- ✓ The banana crop is the most important agriculture activity in the Caribbean region.
- ✓ 14,0000 ha in banana for Zona Bananera in Colombian Caribbean region.
- ✓ The use of wetland and mangrove soils with groundwater affected by saltwater intrusion increase soil salinity problems.
- ✓ Due to the high cost salinity maps doesn't exist.
- ✓ NIR become cheap & fast alternative for monitoring salt affected soils (SAS).

Methodology

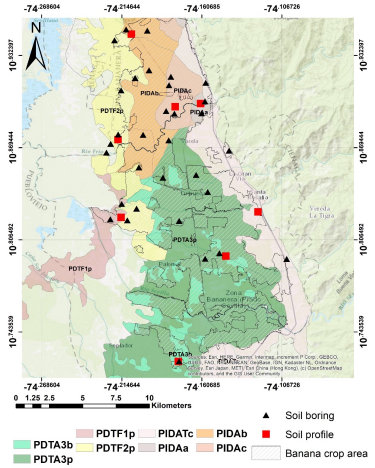
- ✓ The study area is located between the Cienaga Grande de Santa Marta (CGSM), and Sierra Nevada de Santa Marta (SNSM).
- ✓ Entisols and Inceptisols (SSS, 2022) are the most common soil orders.
- ✓ Ustic soil moisture regime predominate, except near the CGSM (Aquic)
- ✓ Mean precipitation is 1332 mm/year, evapotranspiration is 1825 mm/year



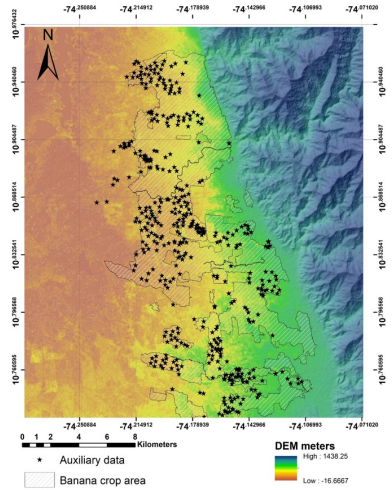


Methodology

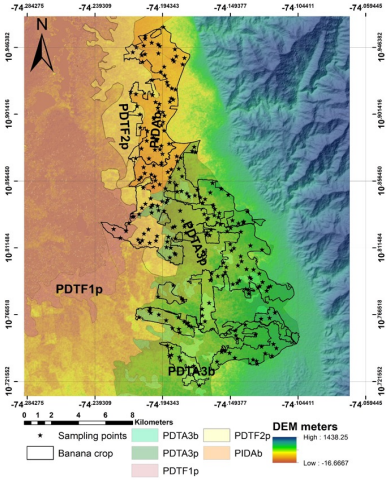
Soil & landscape relation



Soils data

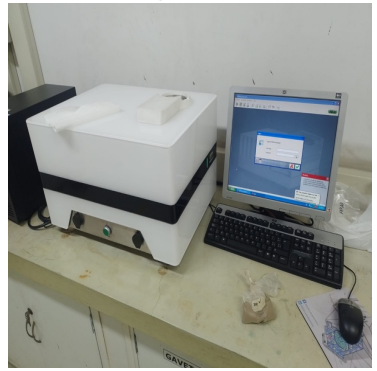


CHLs (Minasny & McBratney, 2006)

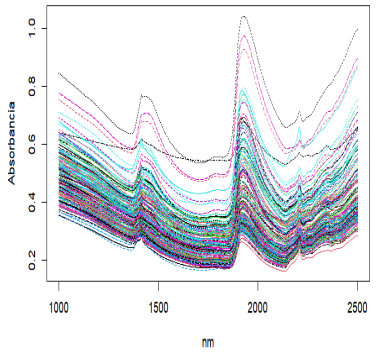


Conventional analyses

Spectroscopy analyses



Spectral models



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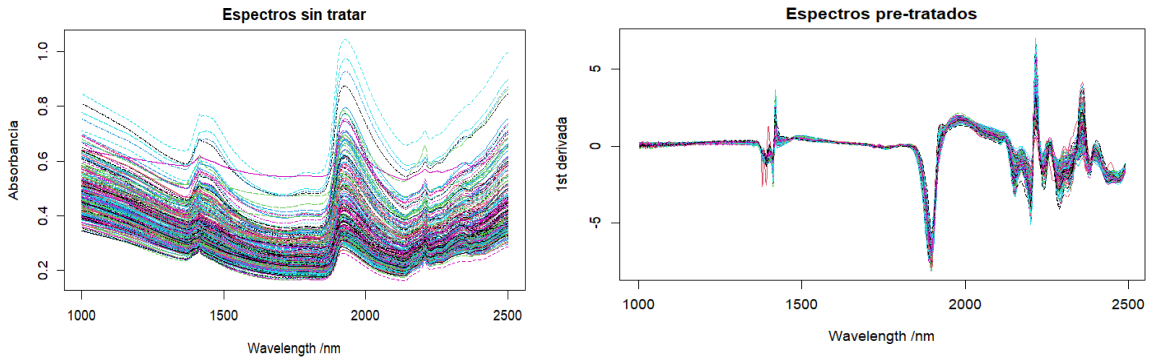
Conventional analyses

Variable	Method	Determination	Units
pH	Saturation paste	Potenciometri	-
EC		Conductimetry	dS/m
Cl		Volumetri	meq/l
SO4		Turbimetry	meq/l
CO3		Volumetri	meq/l
HCO3		Volumetri	meq/l
Ca, Mg, K, Na		Atomic absortion	meq/l
RAS	Estimated by sum of exchangle bases	-	-
PSI		-	%

Spectral analyses

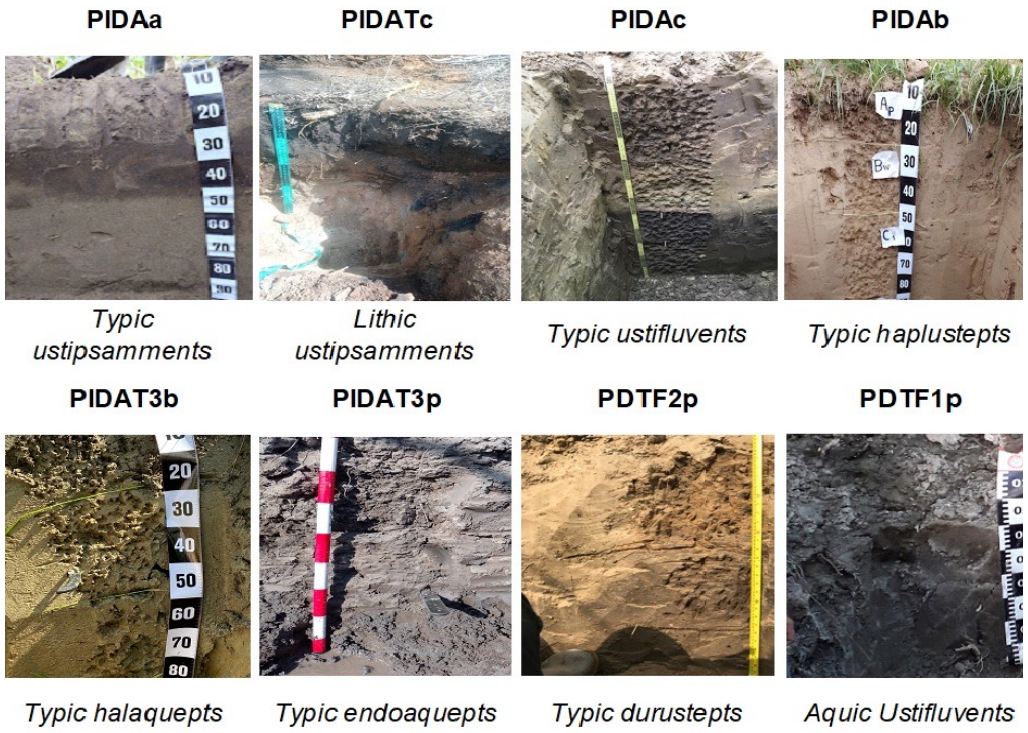
- SIMCA, PLS-DA, OPLS-DA (Supervised analyses)
- PLS, PCR (Prediction model).
- Pretreatments: Savitzky & Golay (1964) smooth & SNV.



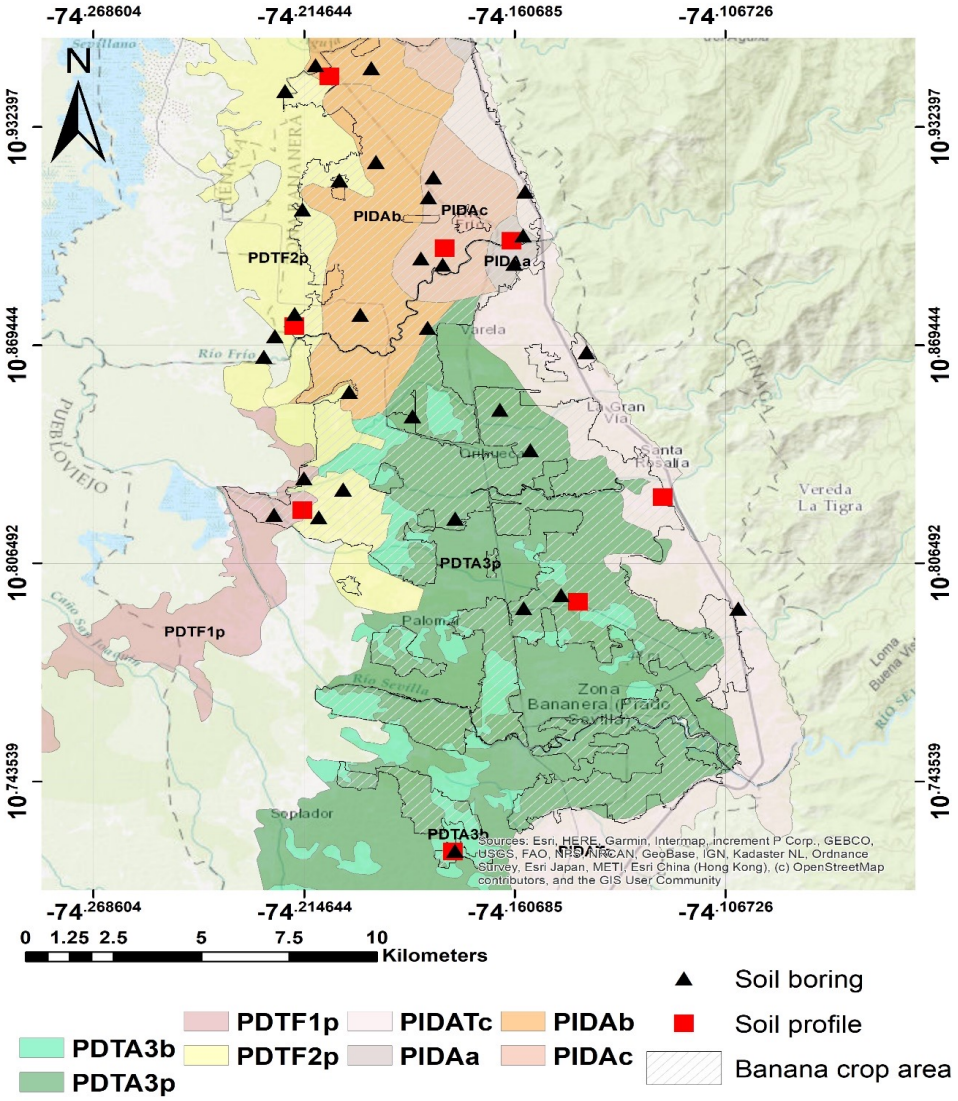
Methodology

Results

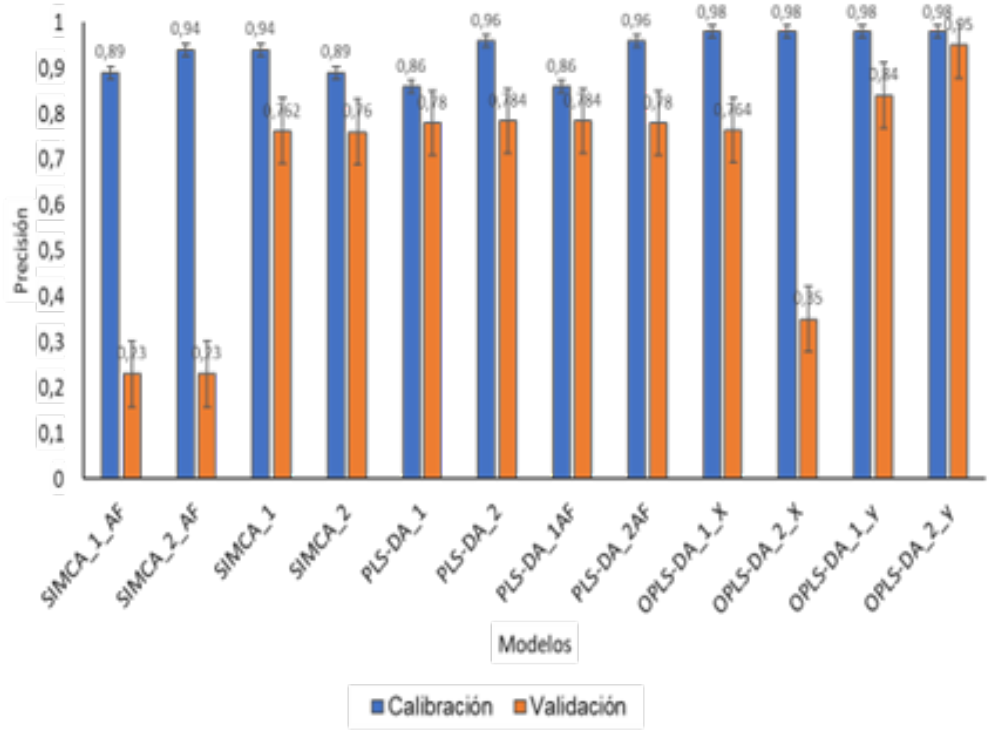
Soils and Landscape Relation

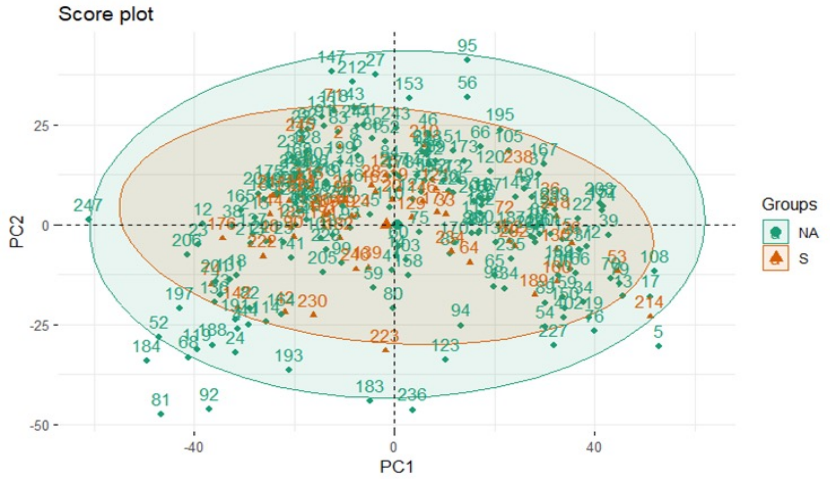


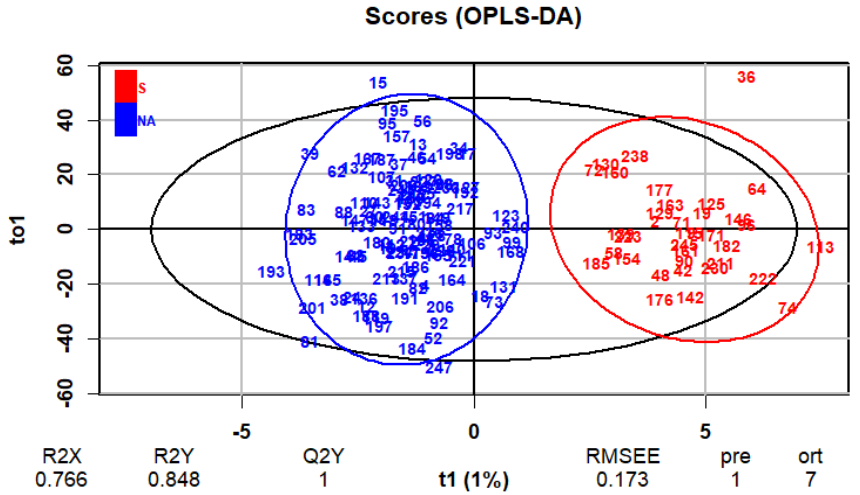
(SSS, 2022)



Spectroscopy model by supervised method

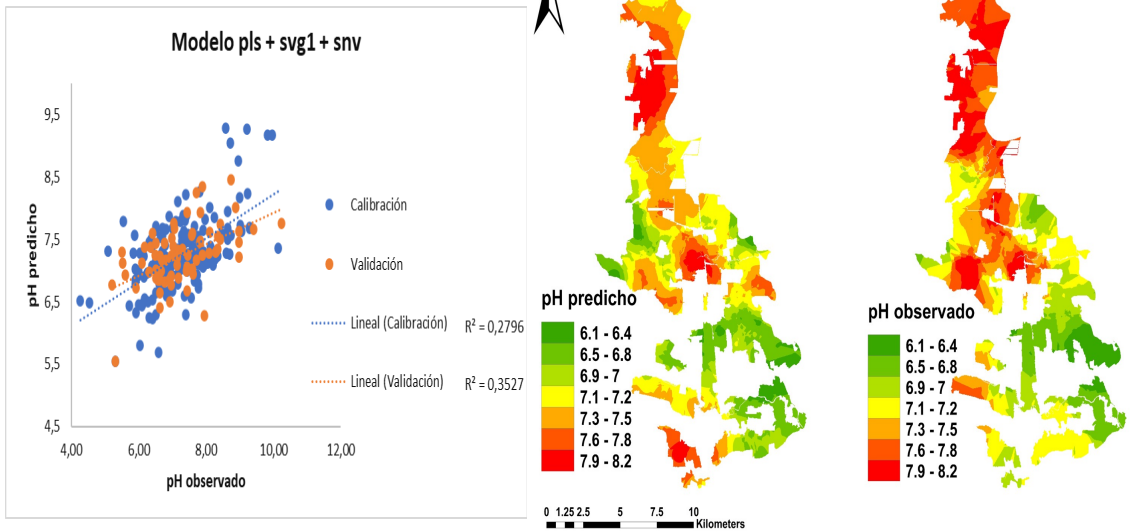




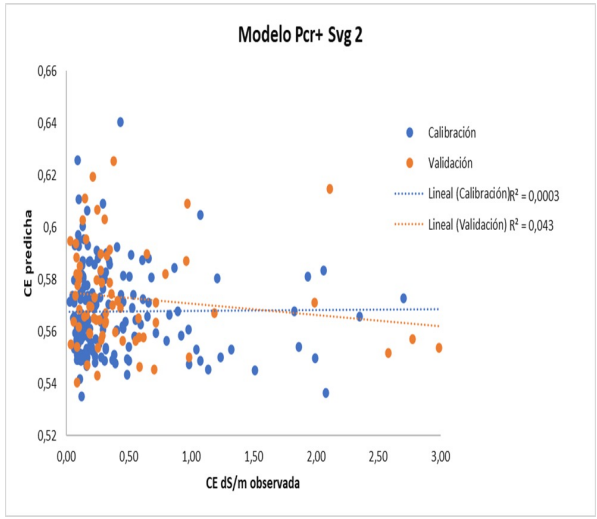


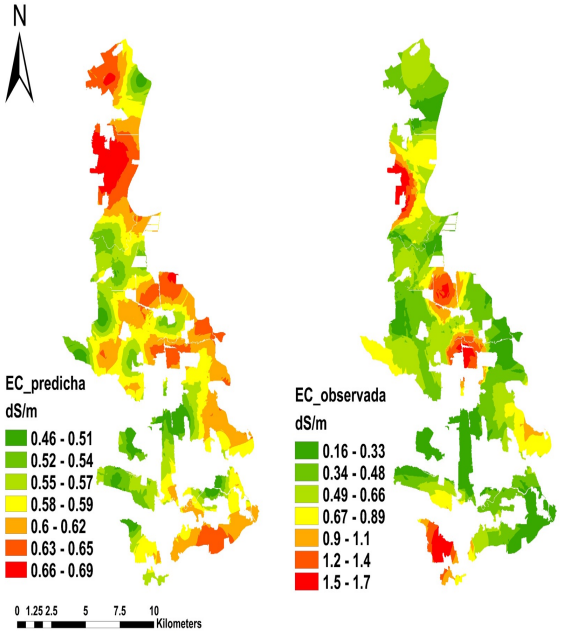
Results

pH Spectroscopy model by prediction method



EC Spectroscopy model by prediction method





Results

Conclusions

- Parental material, weather and the landscape were the most important factors in relation to SAS.
- Soils in low fluvio-marine terraces had high concentration of Cl- & HCO3- .
- Parental material and geomorphology conditioned water table fluctuations and SAS presence.
- Wetlands, mangrove and low lands areas were affected by soil sodicity.
- The relation soil and landscape was an useful tool in the study of SAS.
- Near-infrared spectroscopy (NIR) improve the precision and reduced cost in SAS maps.
- Through calibration, validation and soil sampling was possible improve the accuracy of propose methodology.

References

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Thank you!.

Some questions?

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