



**INTERREG III B
ESPACIO MEDOC**

DESERTNET



FEDER

MONITORING AND ACTIONS TO COMBAT DESERTIFICATION IN THE MEDITERRANEAN EUROPEAN REGION

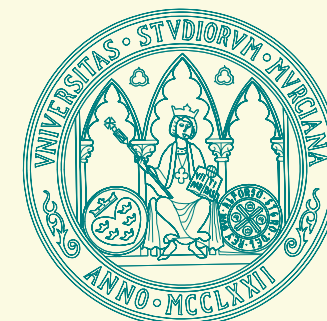
**Región de Murcia
Spain**



**Comunidad Autónoma
de la Región de Murcia**

Dra. Carmen Pérez Sirvent

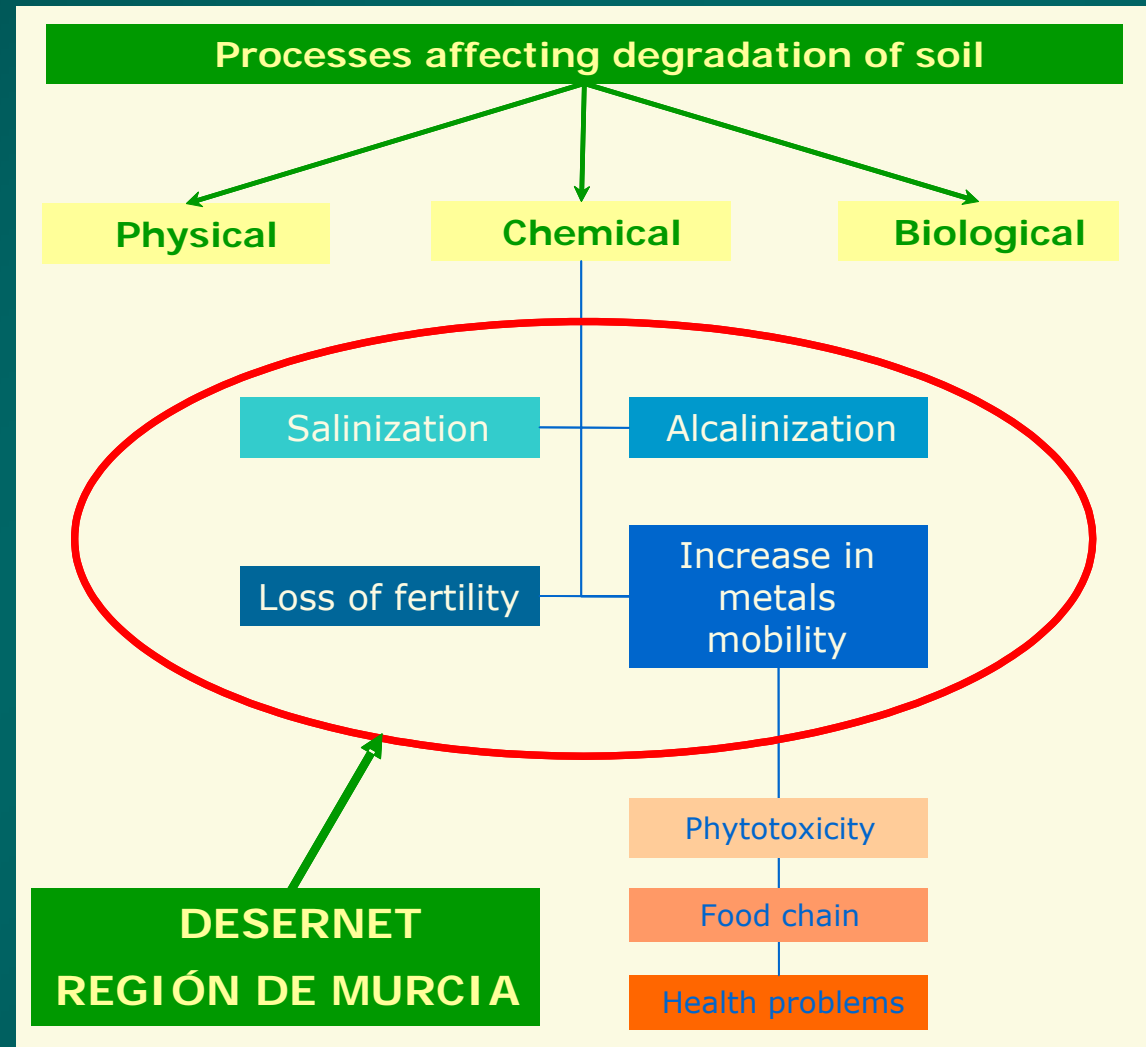
**Profesora Titular de la
Universidad de Murcia**



Universidad de Murcia

OBJECTIVES

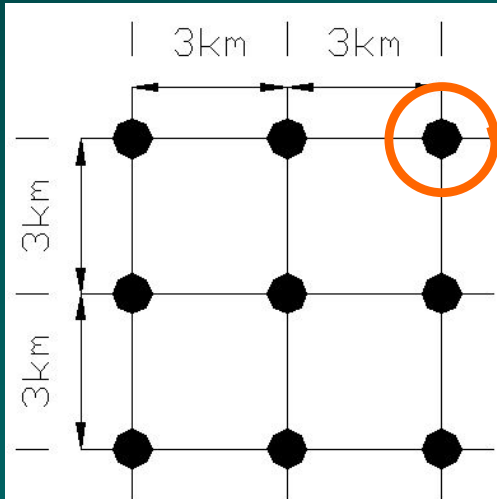
- To extend desertification studies to factors that haven't been treated enough, such as chemical degradation of soils.
- To obtain information and elaborate indicators related to changes in land uses and its management in the four pilot areas selected.
- To distinguish between natural and anthropogenic factors, with the purpose of suggesting action and remediation plans in addition to good management practices that can be included in agricultural and environmental policy.



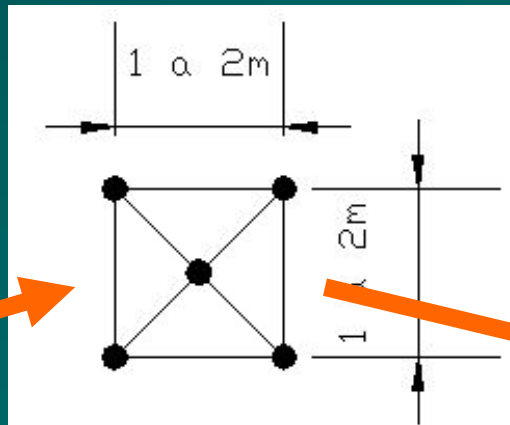
METHODOLOGY

Design of sampling

Square plot (3x3 km)



Soil sampling



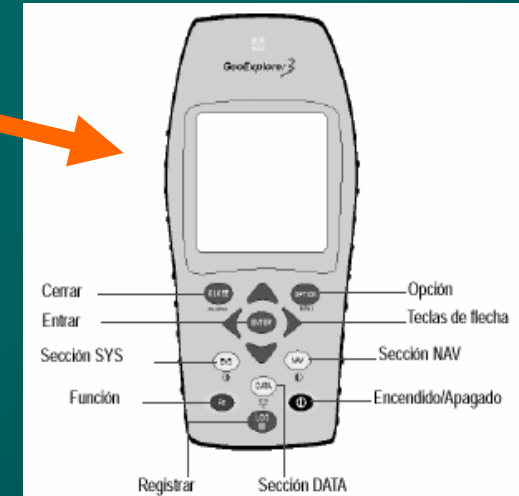
5 superficial samples
(0 - 25 cm)

Mixing and
homogeneization

Representative
sample of sampling
point

LABORATORY

GPS



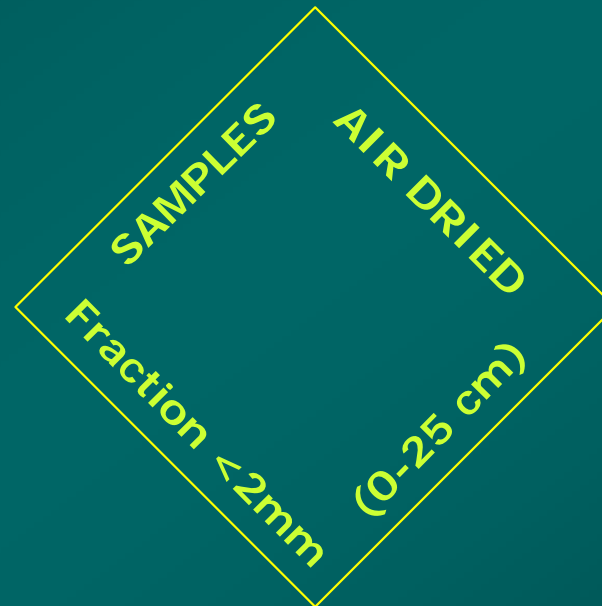
METHODOLOGY

**PLANT- AVAILABLE METALS DETERMINATION
(DTPA, Lindsay and Norvell, 1978)**

Micronutrient metals: Zn, Cu, Fe y Mn

Phytotoxic metals: Pb y Cd

**pH, 1:1 extracts
Peech's Method
(1965)**



**EC, saturation
extract
(Rhoades, 1982)**

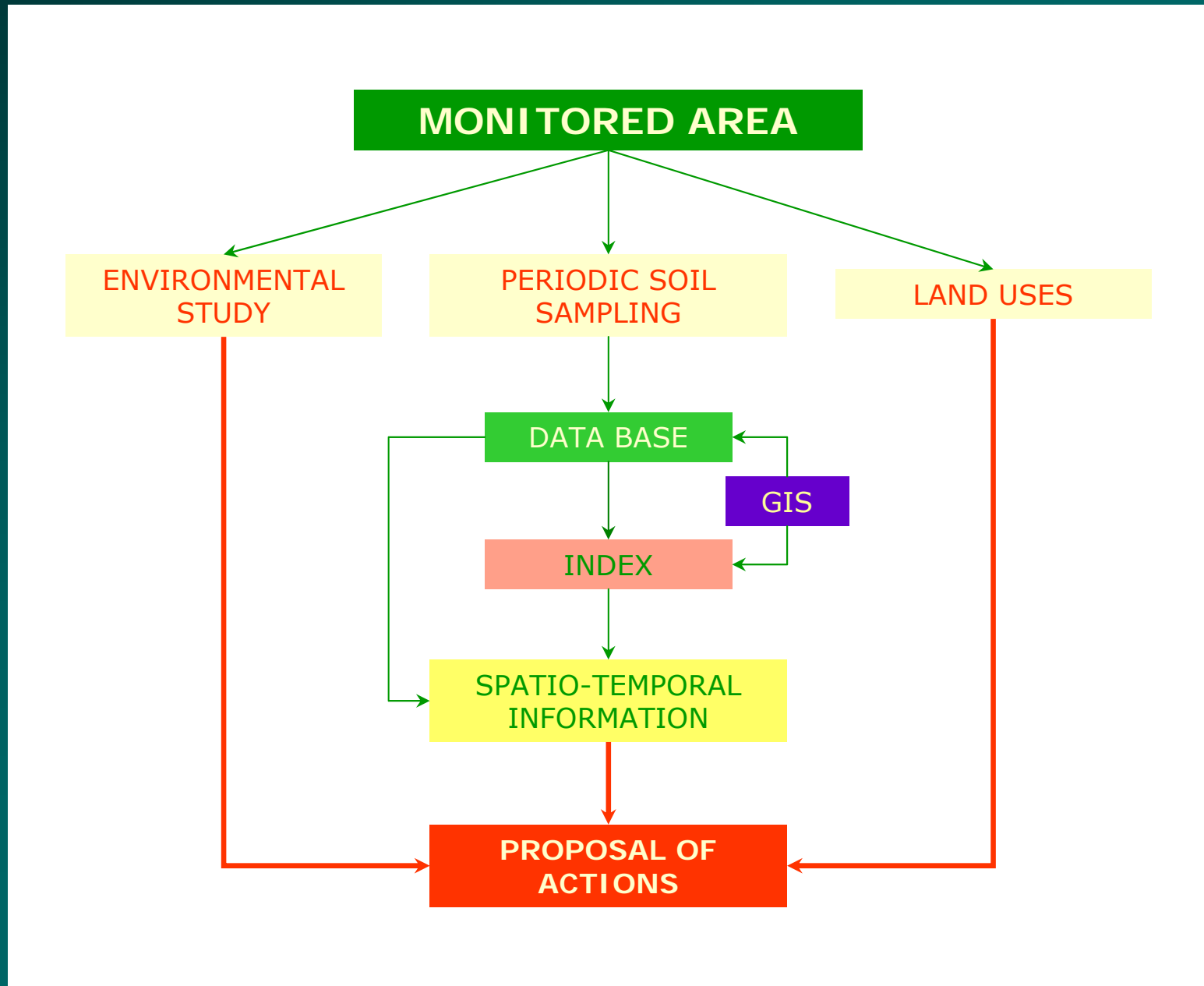
**Soluble salts
(IC)
SAR**

MINERALOGICAL COMPOSITION (XRD)

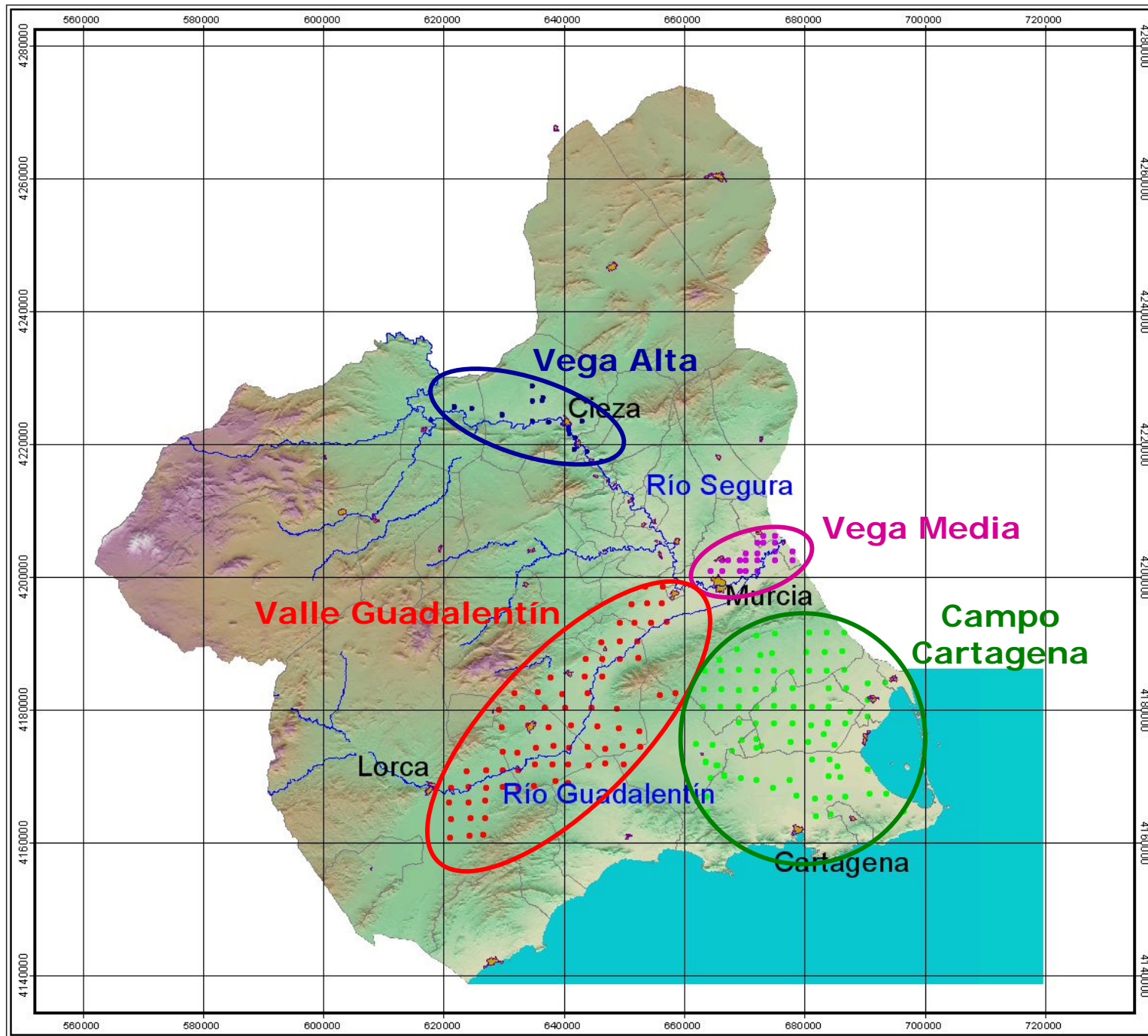
STATISTICAL ANALYSIS OF RESULTS

GIS METHODOLOGY

MONITORING METHODOLOGY



Sampling points location map



Región de Murcia Mapa de Localización de Puntos de Muestreo

Leyenda

- Limites Municipales
- Cauces fluviales

Puntos de Muestreo

- Valle del Guadalentín
- Campo de Cartagena
- Vega Alta
- Vega Baja



0 10 20 30 Kilómetros

Campo de Cartagena: 84 samples

One of the most important agricultural areas in the Región of Murcia, with a highly productive irrigated agriculture and metal-mining influence. No salinization problems due to parent material.



Valle del Guadalentín: 73 samples

Alluvial soils in the Guadalentín River Basin, with historical irrigation systems, at present coexisting with a highly productive irrigated agriculture. Salinization problems, mainly due to natural factors although human actions have influenced the process.



Vega Alta: 26 samples

Alluvial soils where intensive agriculture is practiced, but not affected by salinization and contamination.

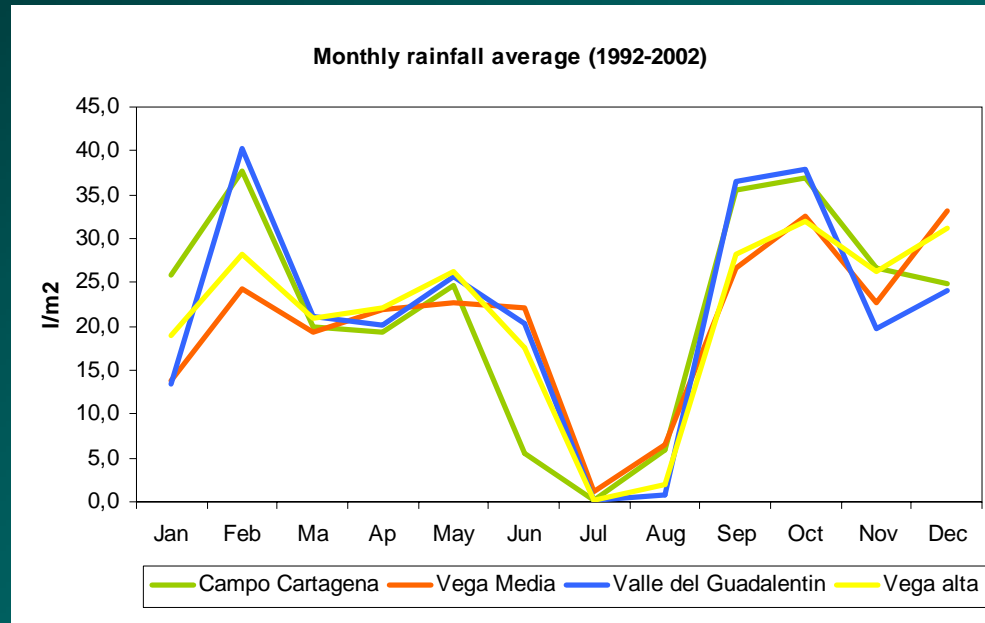


Vega Media: 22 samples

Alluvial soils in the Segura Basin that have long been dedicated to growing a variety of crops. During recent years, however, they have suffered a number of impacts from various sectors including urban expansion, intensification of agriculture practices and the use of poor quality irrigation water.

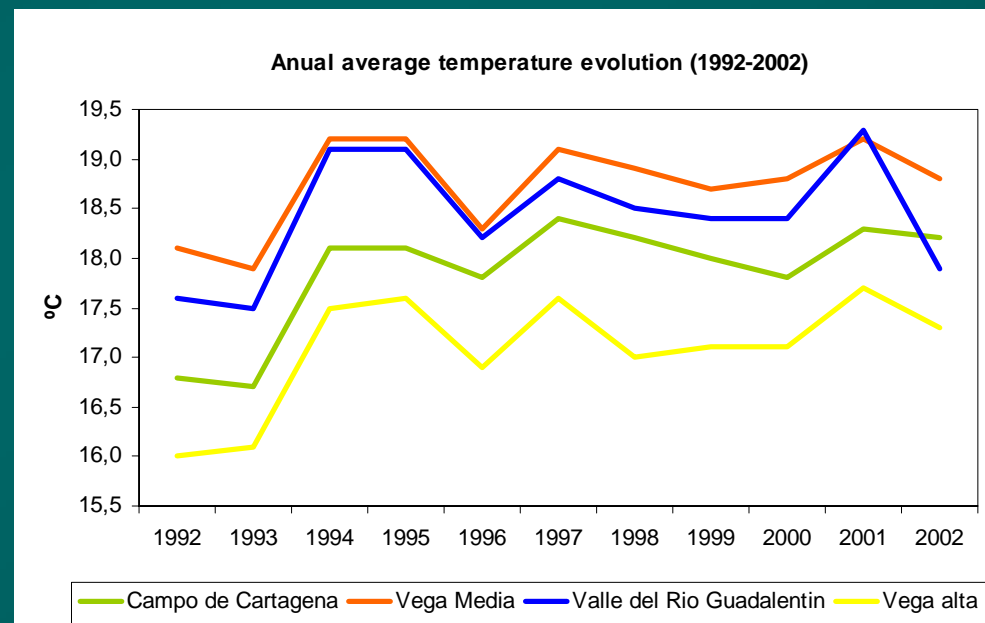


CLIMATIC CONDITIONS



Semiaridic Mediterranean climate

$R < 350 \text{ l/m}^2$ $T_m = 16-19^\circ\text{C}$



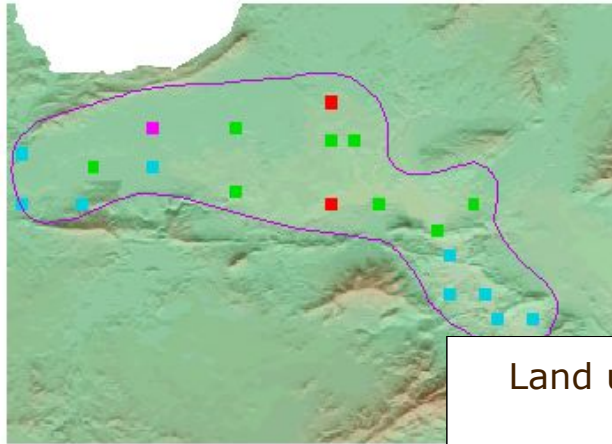
DATA BASE

50 MAPS

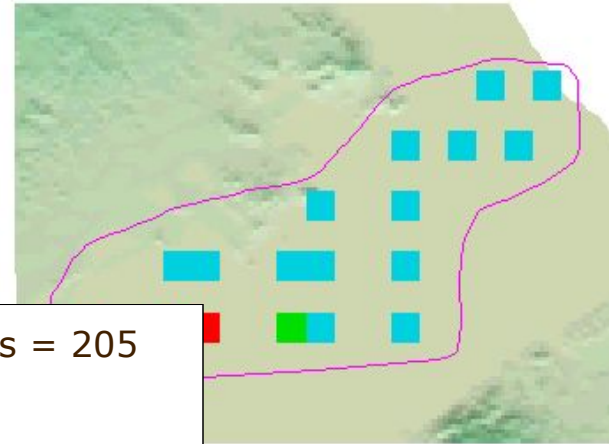
- Mineralogical composition
- land use
- pH
- EC
- SAR
- Fe
- Cu
- Mn
- Zn
- Pb
- Cd

DATA BASE

Land uses map in the four pilot areas

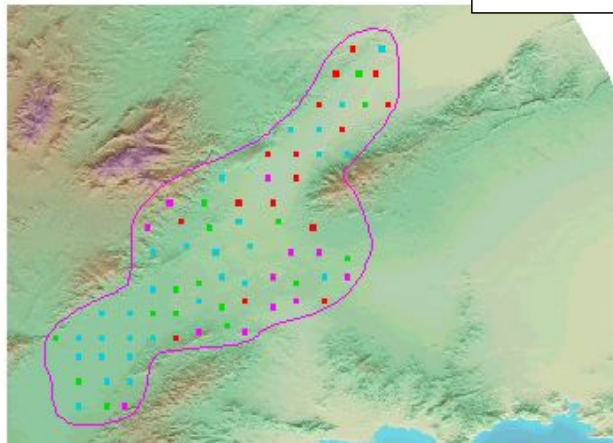
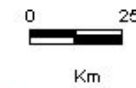
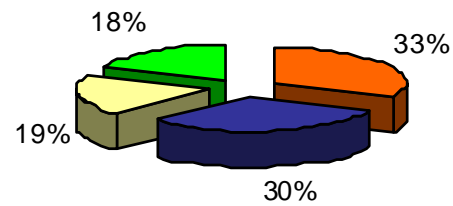


Vega Alta

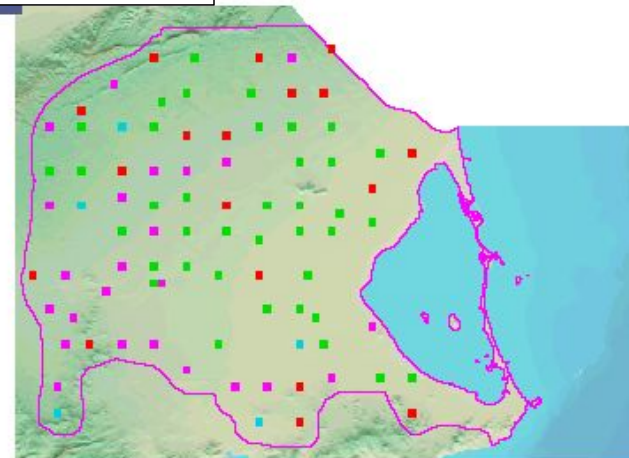


Vega Media

Land uses. Total of samples = 205



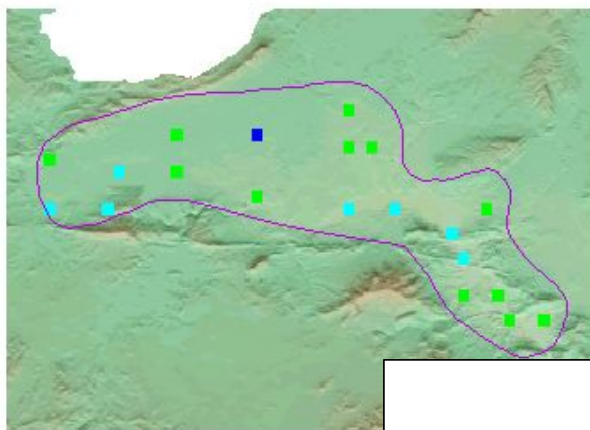
Valle Guadalentín



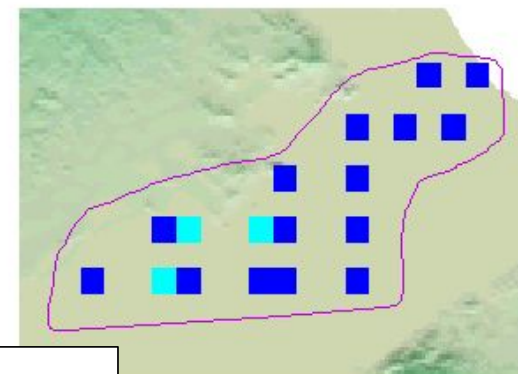
Campo Cartagena

DATA BASE

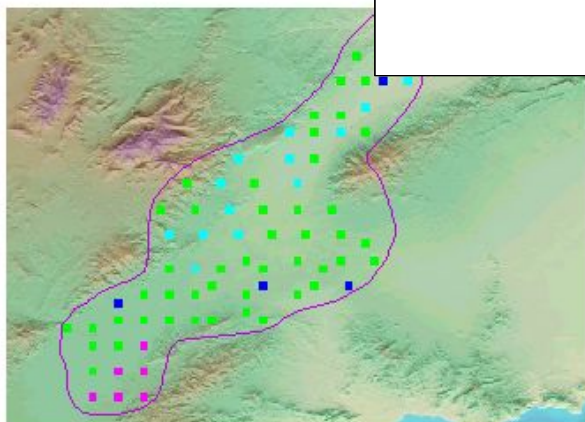
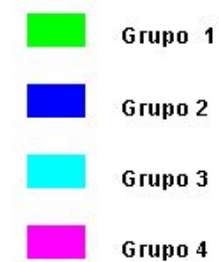
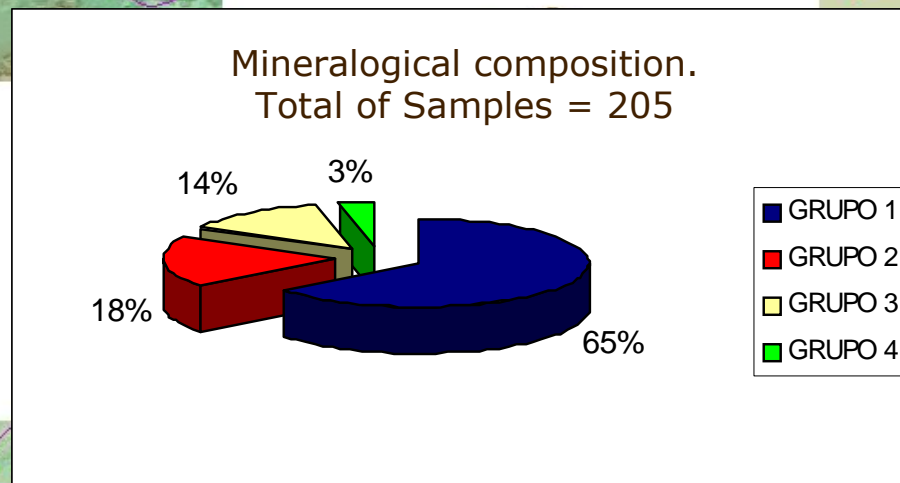
Mineralogical composition map in the four pilot areas



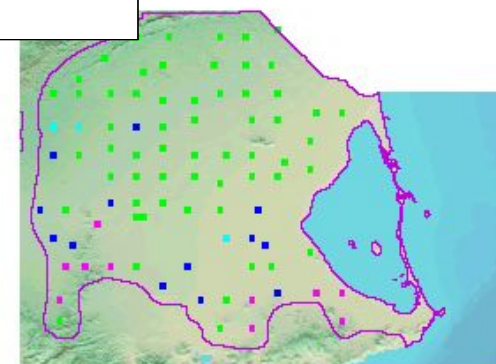
Vega Alta



Vega Media



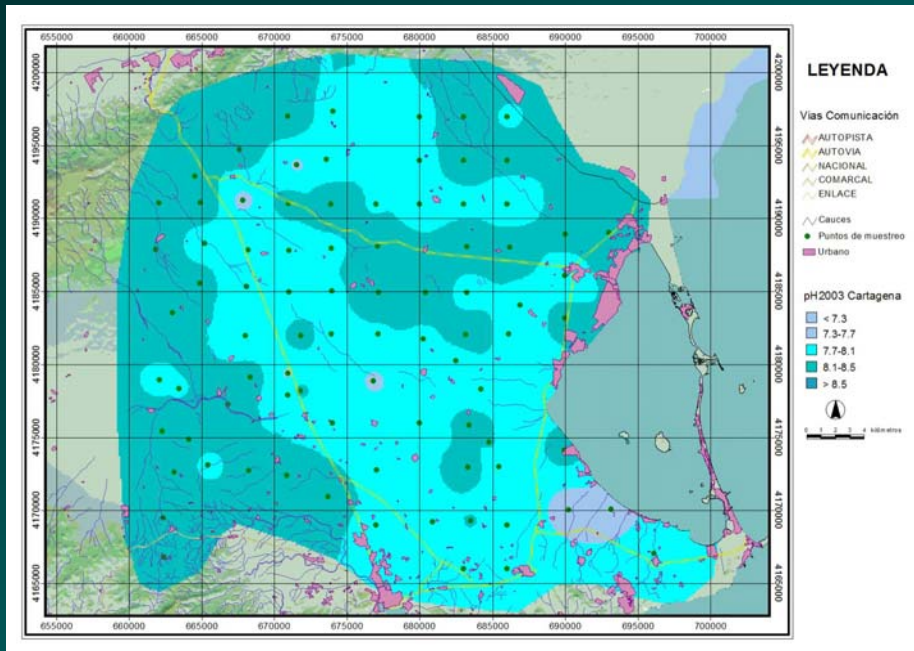
Valle Guadalentín



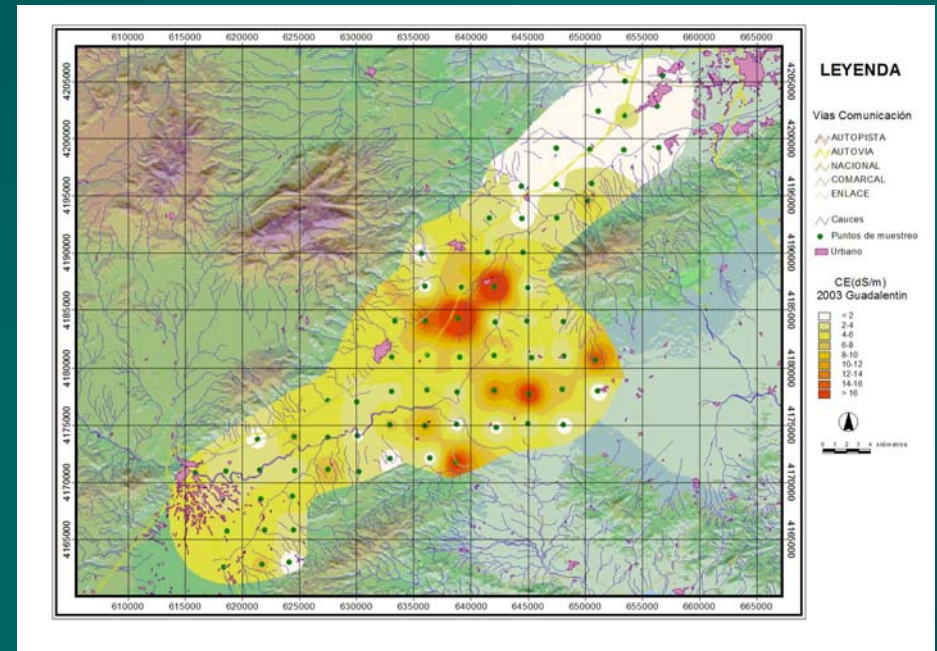
Campo Cartagena

DATA BASE

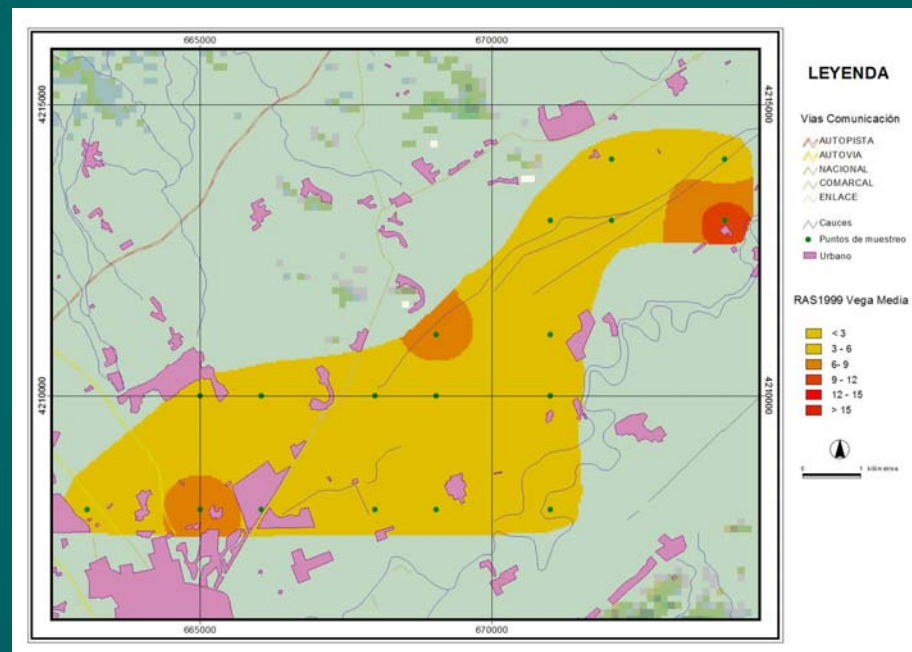
pH distribution map



EC distribution map

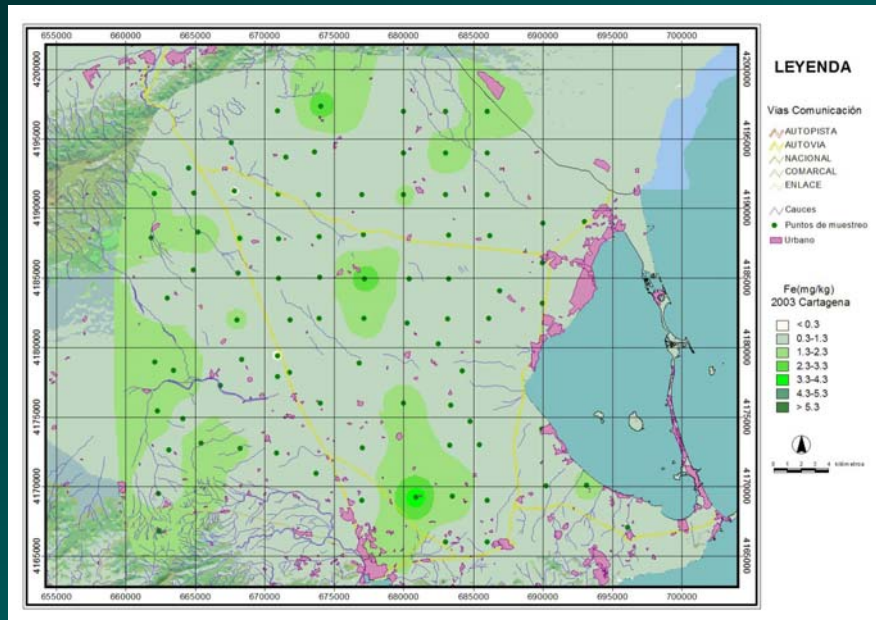


SAR distribution map

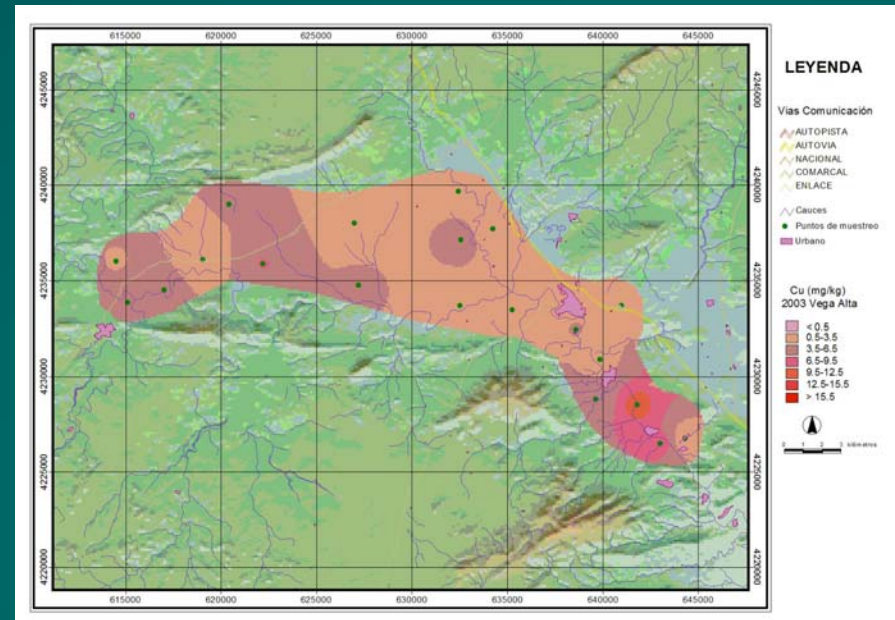


DATA BASE

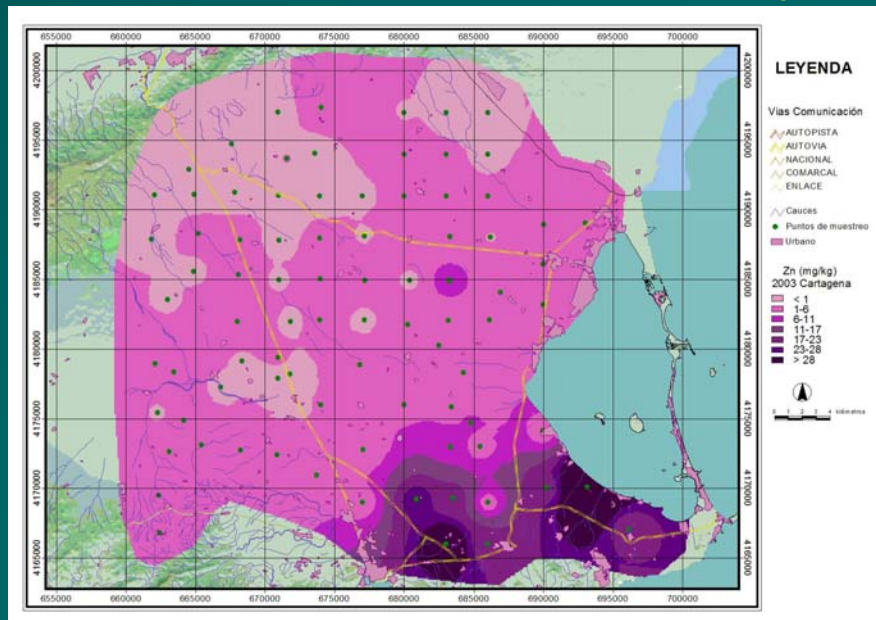
Plant-available Cu distribution map



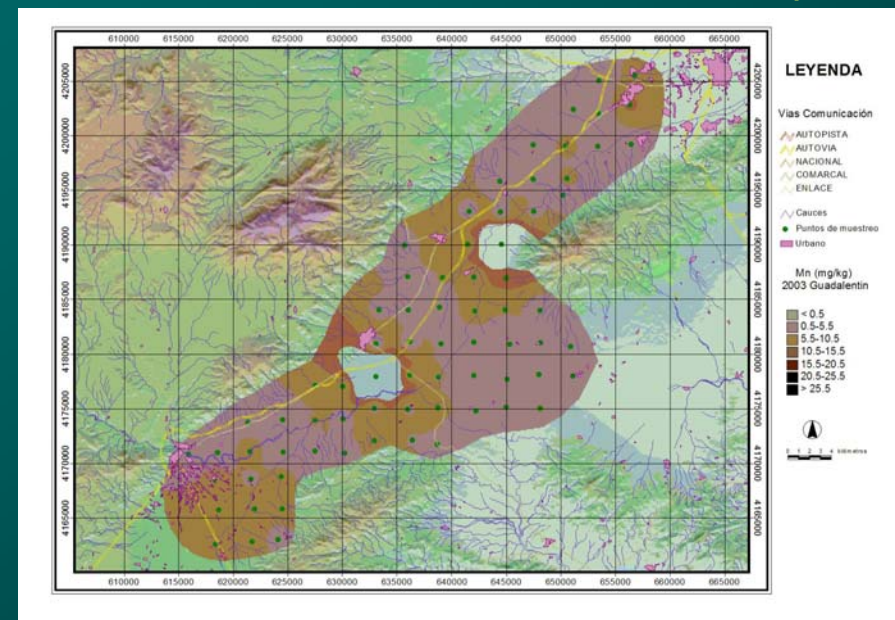
Plant-available Fe distribution map



Plant-available Zn distribution map

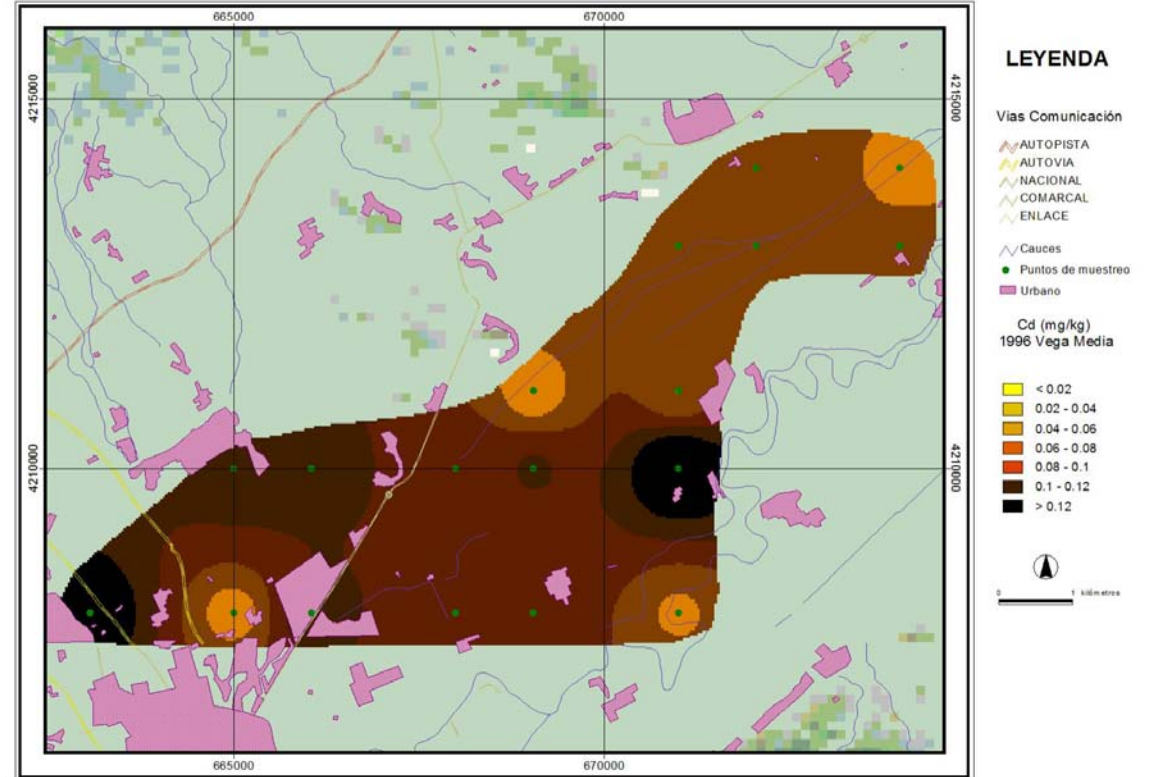
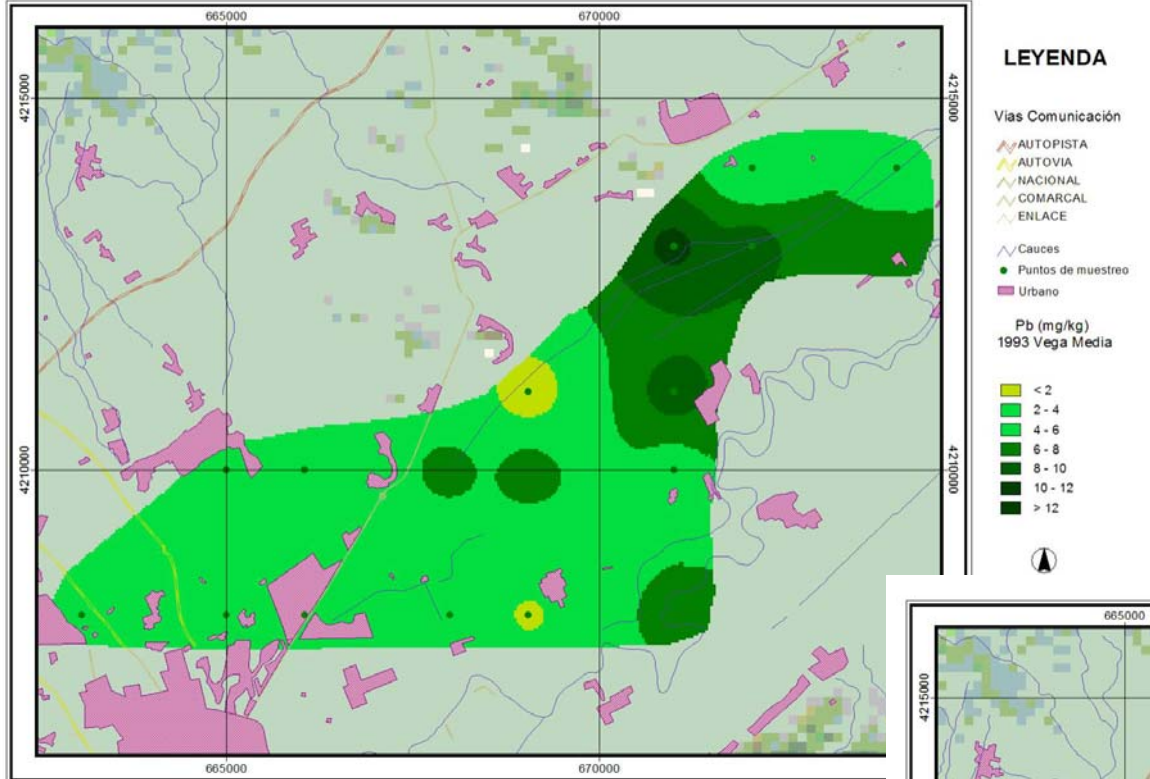


Plant-available Mn distribution map



DATA BASE

Plant-available Pb distribution map



Plant-available Cd distribution map

DEFINED INDICATORS:

- State of salinization (four pilot areas).
- Rate of salinization (four pilot areas).
- State of alcalinization (Vega Media).
- Rate of alcalinization (Vega Media).
- Loss of fertility: loss of micronutrient metals Fe, Cu, Mn and Zn (Vega Media).
- Risk of phytotoxicity: Increase of plant-available Pb and Cd (Vega Media).

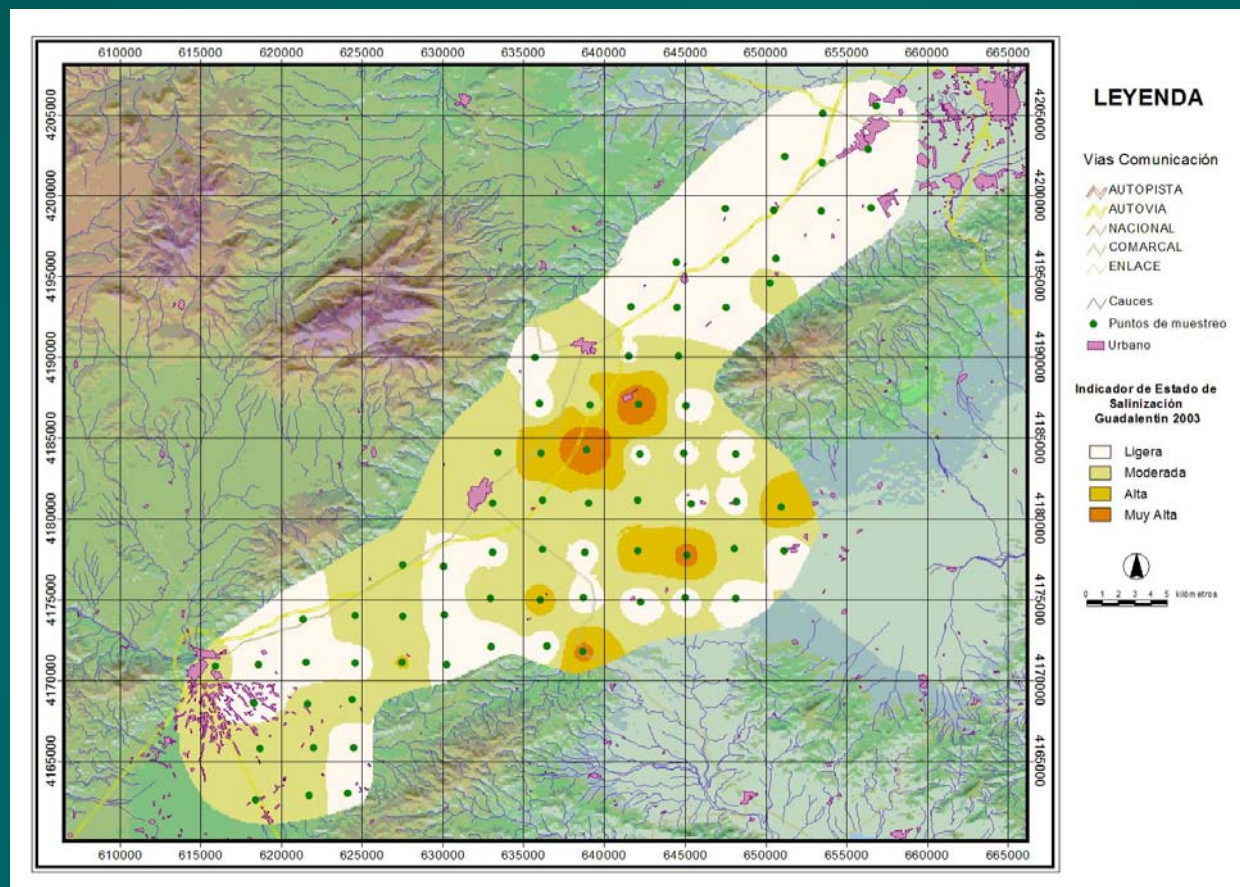
21 MAPS

STATE OF SALINIZATION INDICATOR: Slight, moderate, high, very high

Objective: Quantitative control of soluble salts in soil by EC values obtained from saturation extract, which reflects an edaphic process that can be due to natural and/or anthropogenic causes.

Method: EC measurement in saturation extracts obtained from a soil paste saturated with deionized water.

Units: ds m^{-1}

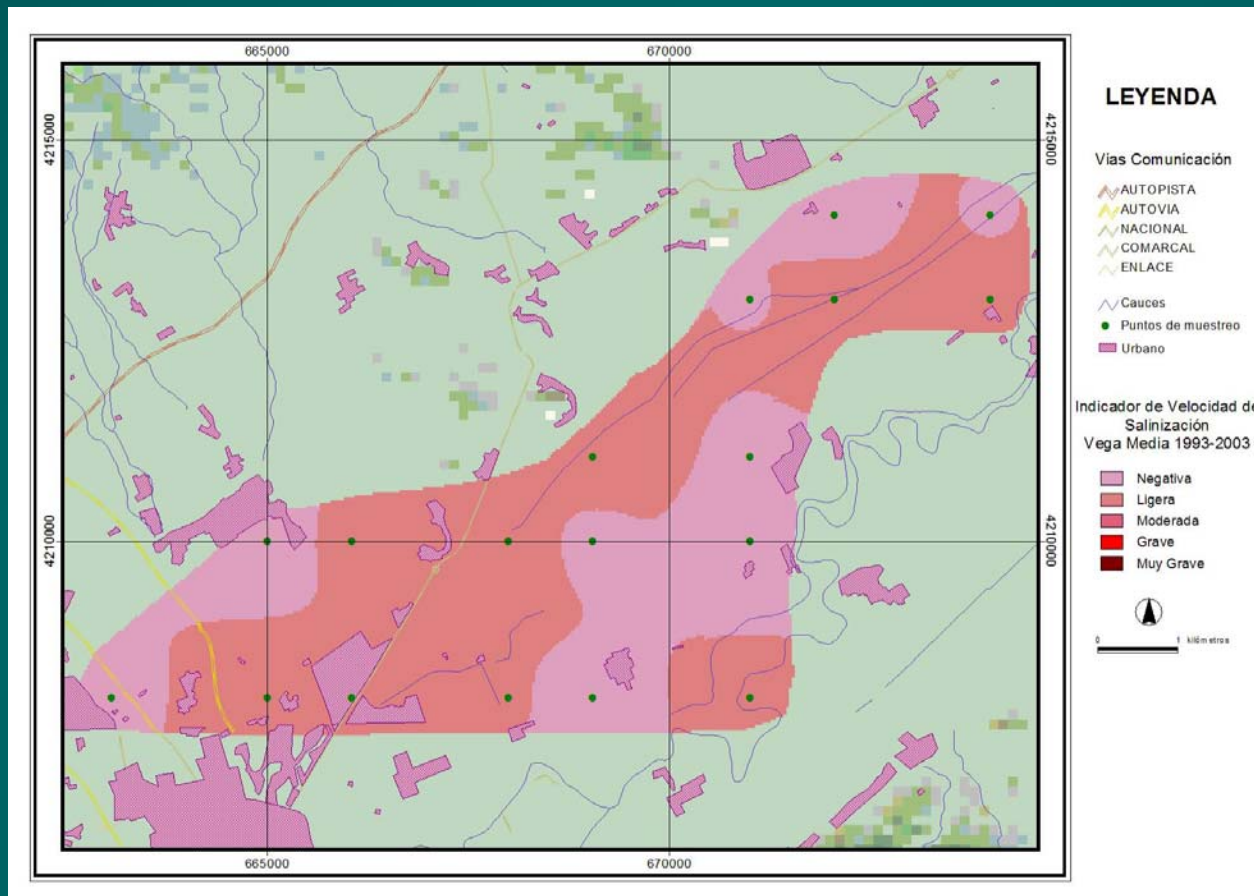


RATE OF SALINIZATION INDICATOR: Negative, slight, moderate, severe, very severe

Objective: Quantitative control of soluble salts variation in soil for a period of time, which reflects an edaphic process that can be due to natural and/or anthropogenic causes.

Method: Diference of EC values in saturation extracts divided by the number of years in the period of time.

Units: $ds\ m^{-1}\ year^{-1}$



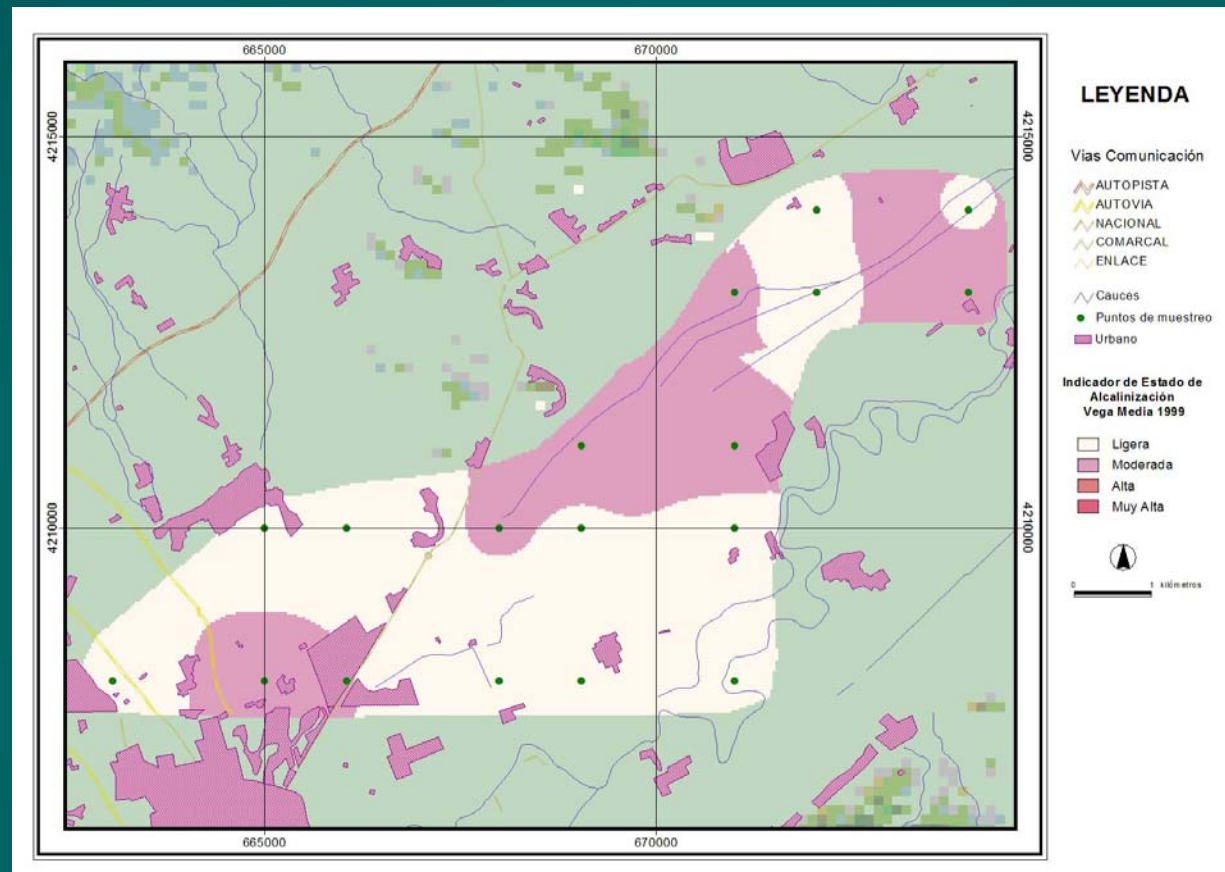
STATE OF ALCALINIZATION INDICATOR: Slight, moderate, high, very high

Objective: Quantitative control of the presence of sodium in soil by SAR values obtained from saturation extract, which reflects an edaphic process that can be due to natural and/or anthropogenic causes.

Method: Measuring Na, Ca and Mg concentration in saturation extracts obtained from a soil paste saturated with deionized water.

Units: Adimensional parameter obtained from the expression

$$SAR = Na / ((Ca+Mg)/2)^{1/2}$$

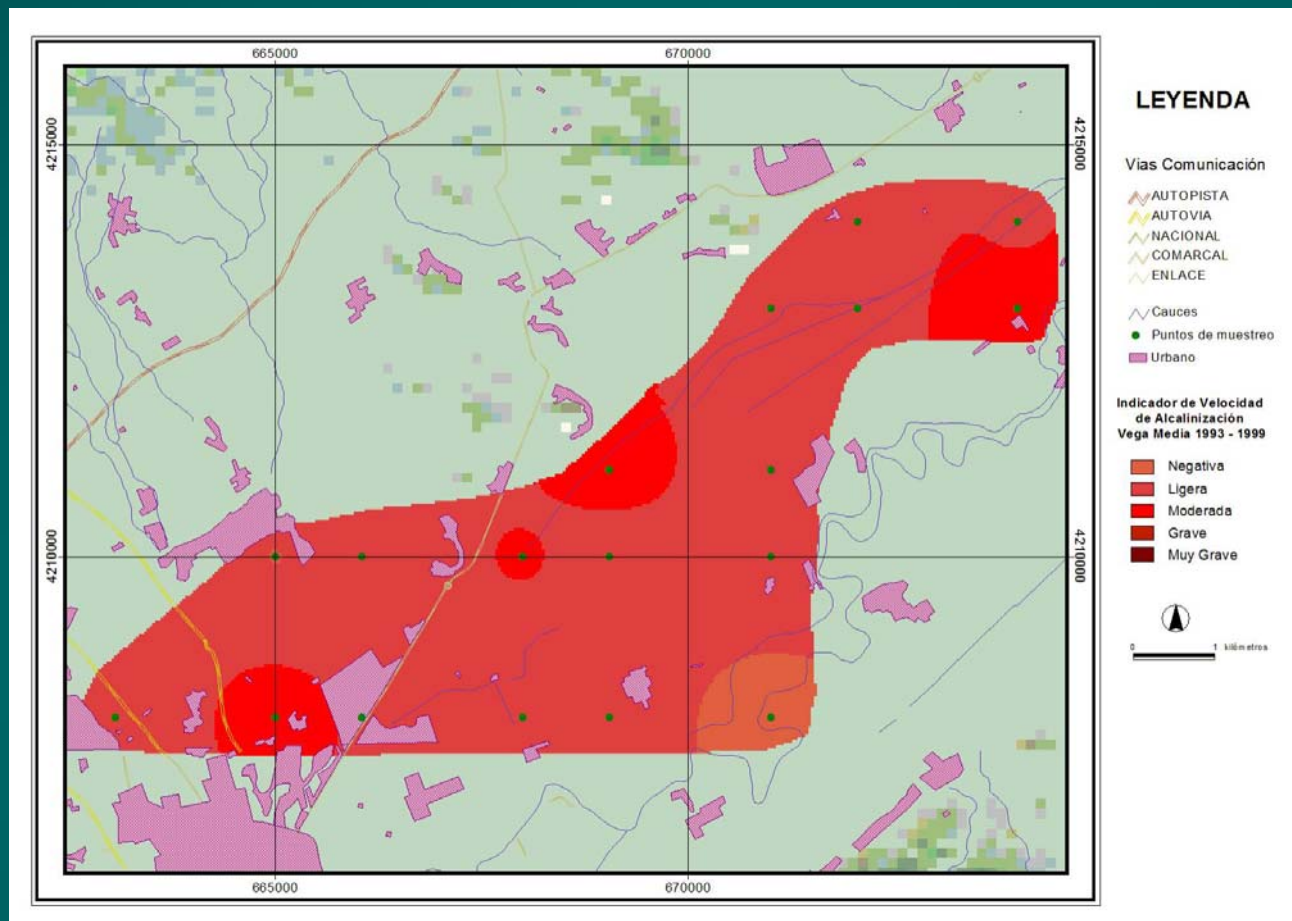


RATE OF ALCALINIZATION INDICATOR: Negative, slight, moderate, severe, very severe

Objective: Quantitative control of the excess of sodium in soil by SAR values for a period of time, which reflects an edaphic process that can be due to natural and/or anthropogenic causes.

Method: Difference of SAR values divided by the number of years in the period of time.

Units: $\Delta\text{RAS year}^{-1}$

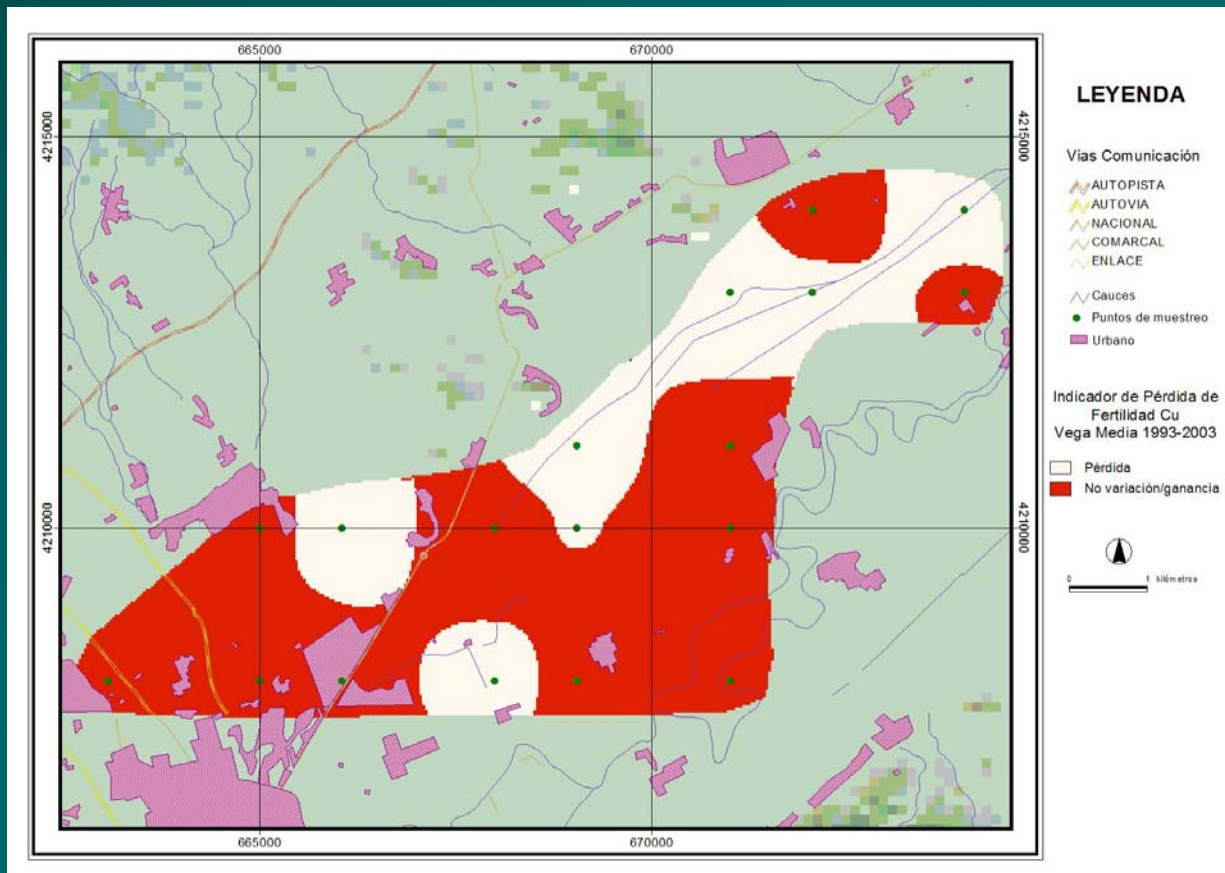


LOSS OF FERTILITY INDICATORS: Loss, no variation/increase

Objective: Evaluation of loss of fertility in a soil, as a function of plant-available micronutrient metals (Fe, Cu, Mn and Zn), for a period of time.

Method: Difference of plant-available micronutrient metals in a 0.005 DTPA solution (Lindsay and Norvell, 1978) divided by the number of years in the period of time.

Units: mg kg⁻¹ year⁻¹



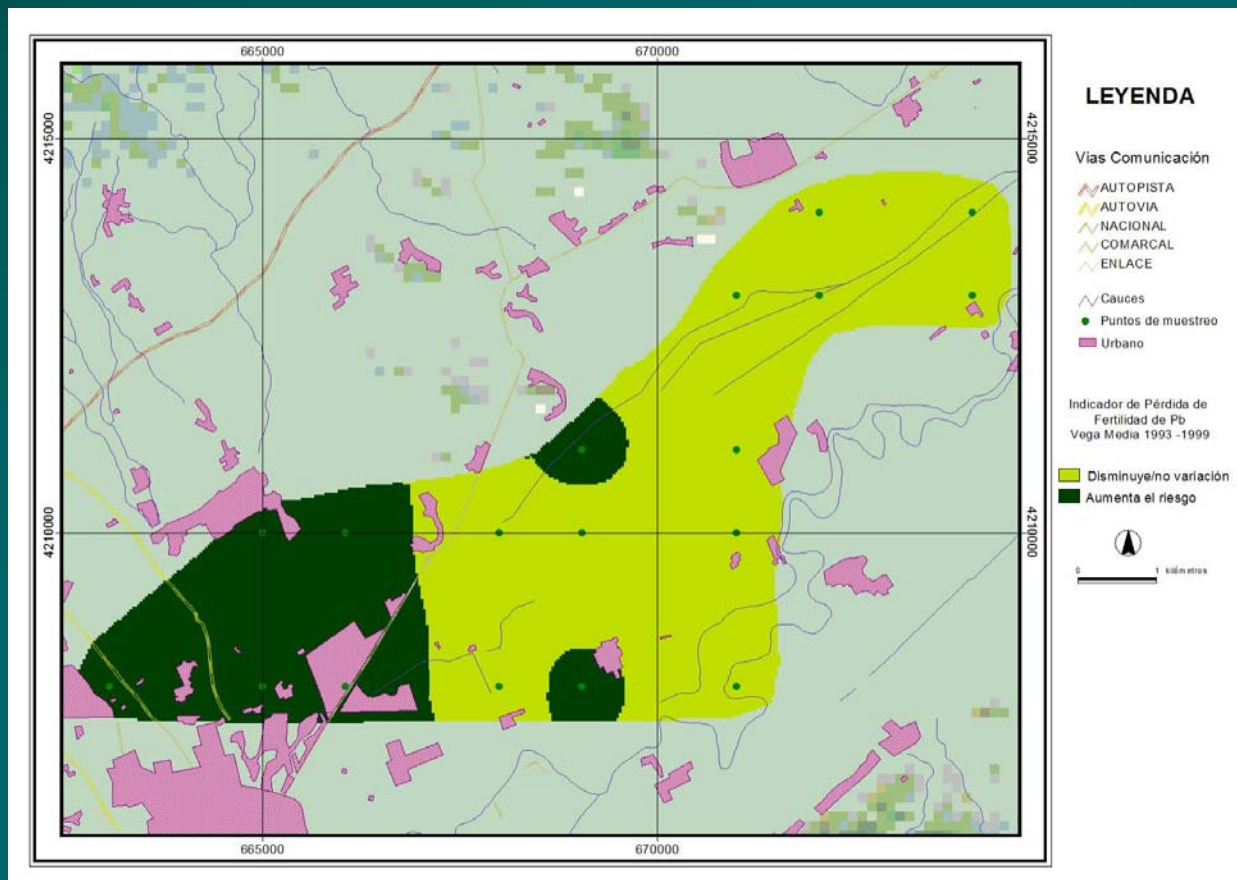
Loss of fertility indicator Fe
Loss of fertility indicator Cu
Loss of fertility indicator Mn
Loss of fertility indicator Zn

RISK OF PHYTOTOXICITY INDICATORS: Increase, decrease/no variation

Objective: Evaluation of risk of phytotoxicity in a soil, as a function of plant-available trace metals (Pb and Cd), for a period of time.

Method: Difference of plant-available trace metals in a 0.005 DTPA solution (Lindsay and Norvell, 1978) divided by the number of years in the period of time.

Units: $\text{mg kg}^{-1} \text{ year}^{-1}$



Risk of fitotoxicity Pb
Risk of fitotoxicity Cd

CONCLUSIONS

DESERNET has allowed a methodology for the identification, monitorization and attenuation of the desertification process to be developed.

Such a methodology is of great interest for the particular case of the Region of Murcia

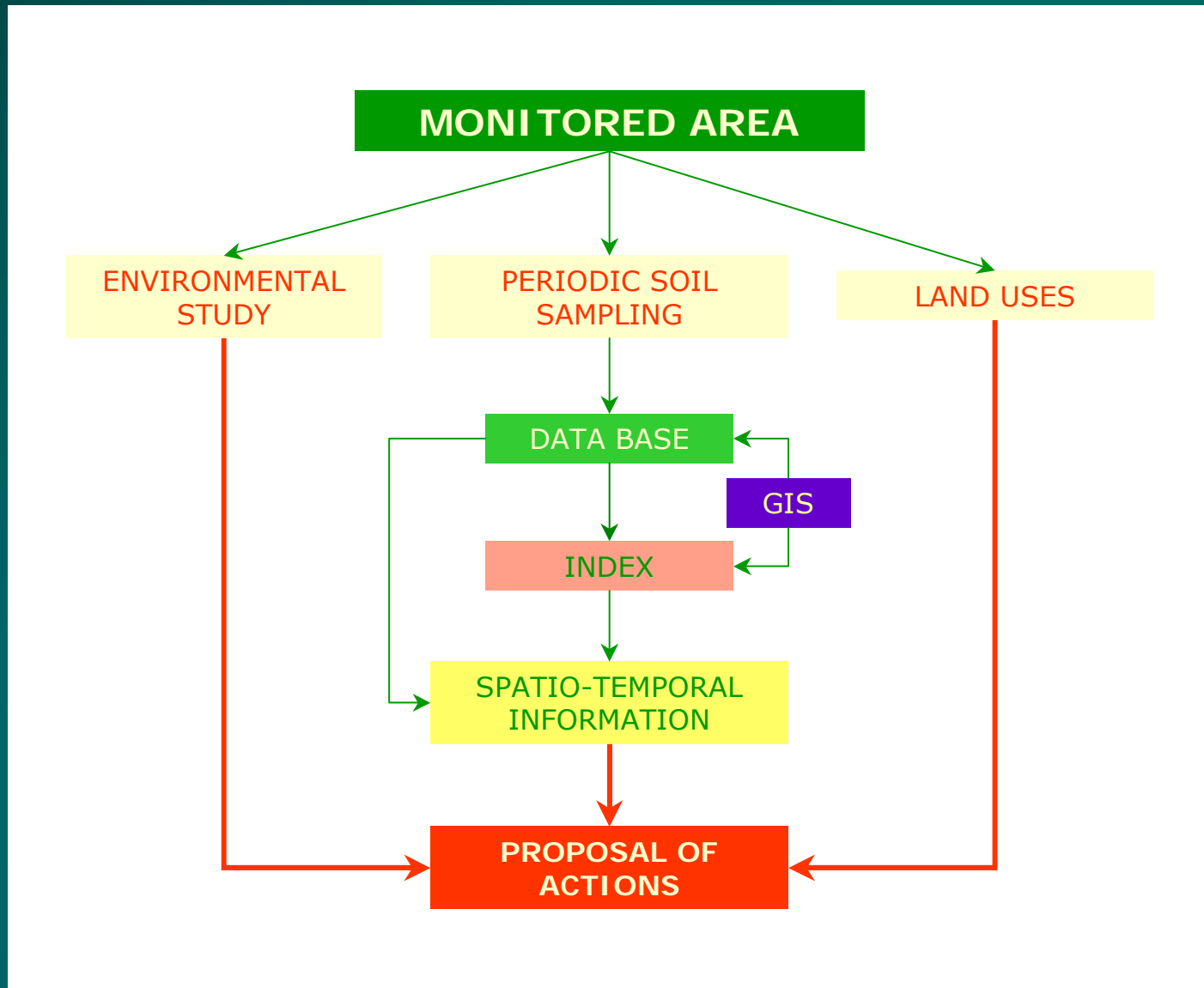
CONCLUSIONS

The indicators applied in the Region of Murcia in the framework of DESERNET are:

- State of salinization (four pilot areas).
- Rate of salinization (four pilot areas).
- State of alcalinization (Vega Media).
- Rate of alcalinization (Vega Media).
- Loss of fertility: loss of micronutrient metals Fe, Cu, Mn and Zn (Vega Media).
- Risk of phytotoxicity: Increase of plant-available Pb and Cd (Vega Media).

CONCLUSIONS

The methodology for the monitorization of the desertification (chemical degradation of the soil) is the following:



CONCLUSIONS

The Region of Murcia is highly interested in pursuing the active participation and exchange of experiences, data and information to control the desertification process.

DESERNET is considered essential to collect, process and spread environmental information in the Mediterranean Basin.

SPECIFIC PROPOSALS FOR THE REGION OF MURCIA

- To continue the surveillance and control of desertification using the methodology developed in the DESERNET-Murcia action.
- To extend the surveillance process until the local scale for those cases for which high salinization/alcalinization values have been found.
- To extend the surveillance process until the local scale for those cases for which a loss for those micronutrient metals or an increase in assimilable heavy metals have been found.
- To carry out a programme in order the different social agents become aware of the importance of the desertification process and the need of joint efforts to confront it.

Thank you for your attention



Grupo de Investigación E48-08. CONTAMINACIÓN DE SUELOS Universidad de Murcia



<http://www.um.es/csoils>