

Methodology for the elaboration of the map “Saline and Sodic Soils in the EU”

Gergely Toth, July 2008

Two major data sources are available to delineate areas threatened by salt accumulation in Europe: the European Soil Database (ESDB 2004, EUR 20422 EN, <http://eussoils.jrc.it/index.html>) and the map of salt affected soils in Europe compiled by Szabolcs (1974). Szabolcs' map was of pressing importance in the 1970's because the salinity and alkalinity of soils hindered the satisfactory agricultural utilisation of lands in many regions.

To delineate an updated map of salt affected soils in Europe, items from the two databases were selected that have characteristics of salt affected or potentially salt effected soils. Potentially salt affected are soils that are not or to a very low degree saline or alkaline at present but human intervention (irrigation) may cause their considerable salinisation and/or alkanisation (Szabolcs, 1974).

The information on salinity and alkalinity, available directly or through pedotransfer rules in the ESDB, is described in detail by Baruth, Genovese and Montanarella (2006). In the WRB (World Reference Base) soil names that give information about salinity are Solonchaks, 'salic' soils, or 'petrosalic' soils. In the definition of Solonchaks, the reference to salinity is given by the presence of a salic horizon within a depth of 50 cm. The salic horizon is a surface or a shallow subsurface horizon which contains a secondary enrichment of readily soluble salts, i.e. salts more soluble than gypsum. The analysis of the available information shows that the information from the soil name can be used to characterise the presence of a horizon having saline properties at a maximum depth of 125 cm.

Three classes of salinity are proposed:

- low: $EC_{se} < 4$ dS/m (deciSiemens per metre)
- medium: $4 < EC_{se} < 15$ dS/m
- high: $EC_{se} > 15$ dS/m

In the WRB, soils having alkaline characteristics are Solonetz, 'natric' soils, or 'sodic' soils. In the definition of Solonetz, the reference to alkalinity is given by the presence of a natric horizon within 100 cm from the soil surface. The natric horizon is a dense subsurface horizon with higher clay content than the overlying horizons and that has a high content in exchangeable sodium and/or magnesium. Solonetz, 'natric' soils, 'sodic' soils and 'endosodic' soils are considered having a high alkalinity. For 'hyposodic' soils, the alkalinity is medium. The analysis of the available information shows that the information from the soil name can be used to characterise the presence of a horizon having sodic properties.

Three classes of alkalinity are proposed for further analysis:

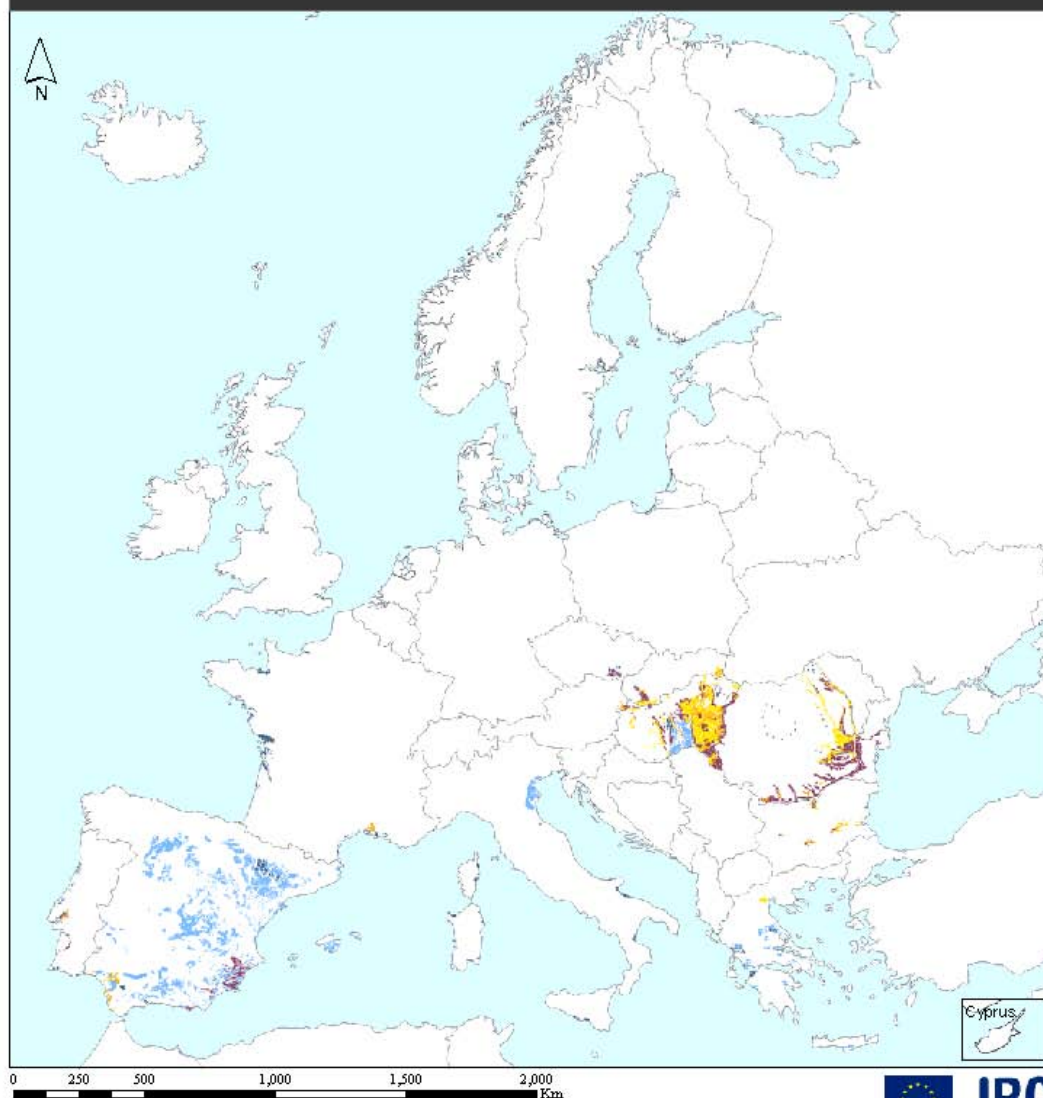
- low: ESP < 6%
- medium: 6 < ESP < 15%
- high: ESP > 15%

The delineation of saline/sodic areas in Europe consisted of the following steps:

- In the first step of the procedure digital geodatabases were prepared from the map of Szabolcs (1974) in the Lambert Azimuthal Equal Area coordination system ('Digital Szabolcs Map'), the same projection as the ESDB. After the databases were in the same reference system, we were able to match the spatial information and explore the semantic components of the data.
- Soil mapping units with saline and/or sodic soils were selected from the ESDB and the percentage share of salt affected areas of the polygons have been calculated. (>50 % and < 50% for saline and alkaline soils.) These polygons were displayed on a separate layer.
- The Digital Szabolcs Map was overlaid by the new salt affected soil layer of the ESDB.
- On areas where both maps had information on salinity, the information from the ESDB took priority. Areas outside the salinity/sodicity layer of the ESDB had been characterized by the 'Digital Szabolcs Map'.

Following this method we compiled an updated version of the salt affected soils map (Figure 1.)

Map of saline and sodic soils in Europe



Occurrence of salinisation / sodification

- Saline > 50% of the area
- Sodic > 50% of the area
- Saline < 50% of the area
- Sodic < 50% of the area
- Potentially affected areas

This map shows the occurrence of salt-affected areas and potentially salt-affected areas in agricultural areas on a scale of 1:1 000 000. To produce an overview of significant salt-affected regions, the most appropriate data is to use 3 main classes (saline soils, sodic or alkali soils and potentially salt-affected soils).

MAP INFORMATION

Spatial coverage: 27 Member States of the European Union where data available.
 Pixel size: 1 km
 Projection: ETRS89 Lambert Azimuthal Equal Area
 Input data - source:
 Map of salt-affected soils in Europe (Szabolcs (1976))
 Soil data - European Soil Database
 Land Use - CORINE Land Cover 2000

BIBLIOGRAPHIC INFORMATION

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