THE *EUROPEAN COMMUNITY SOIL* PROJECT IN SPAIN

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ABSTRACT

The study of the Pedology is very important for some parts of the science and for some parts of the engineering. Modern researches about agronomy joined to the territorial planning and the use of natural resources are struggling against the erosion and against the desertitation, all of this involves the learning of the different kind of soil in each part of the Earth. More than twenty-five years ago different Soil Services are developing some projects to get cartography bases, in the same way, for help to the technicians and the scientists.

In that sense, this paper holds back the most basic aspects to perform a common cartographic project about soil in European Union on the scale 1: 1 million joined to the FAO terminology. This project contains not only digitizing cartography but it contains descriptive data bases of the different kind of soils of the countries in the European Union

1. Introduction

This paper summarizes contents from the 368 poster which was taken out of the second section of this 17th International Cartographic Conference. We are going to explain the main contents of the cartography and data base project about European Union soil.

Soil is one of the essential factors for the monitoring of crops and the prediction of yields. Since 1985, there has been a soil map on the scale 1:1 million, harmonized according to a legend closed to the FAO classification and covering the land of European Communities countries (i.e. [6] p. 7).

The main aspect of this project is a map (see Figure 1). It is the result of considerable work undertaken by the soil mappings services of the different countries (i.e. [5]). The quantity of information collected was very large and had to be summarized so that an easy-to-use map. It was decided to display the dominant pedogenic processes. This involved a considerable loss of basic data describing elementary soils units.

The computerized map represents considerable boundary digitizing work (geometrical set of the database). The semantic set characterize the different soil units.

Spain is incorporated at this project in 1990s. The Centro de Ciencias Medioambientales of the CSIC (Consejo Superior de Investigaciones Científicas) has participated in it. Ph.D. Juan José Ibáñez is one of the most important research in this Spanish part of the project. Next to him, the author of this paper, participated in the project in the cartographic aspects, in particular, in the GIS technology. This work was realized in 1993 and 1994.

The work required two stages:

a) For the geometrical set, a check was performed for each database polygon identifier.
b) For the semantic set, corrections an addition of variables.

2. General description of the project.

2.1. Cartography

The project includes a cartographic set with their database and a description of the profiles more representatives in each country.

The general characteristics of the cartography are:

* projection: Lambert Azimuthal Equal Area.
* Standard projection of the CORINE database.
* Units: meters.
* Spheroid: International 1909.
* Longitude of center of projection: 9° E
* Latitude of center of projection: 48° N
* Radius of sphere of reference: 0
* False easting: 0
* False northing: 0

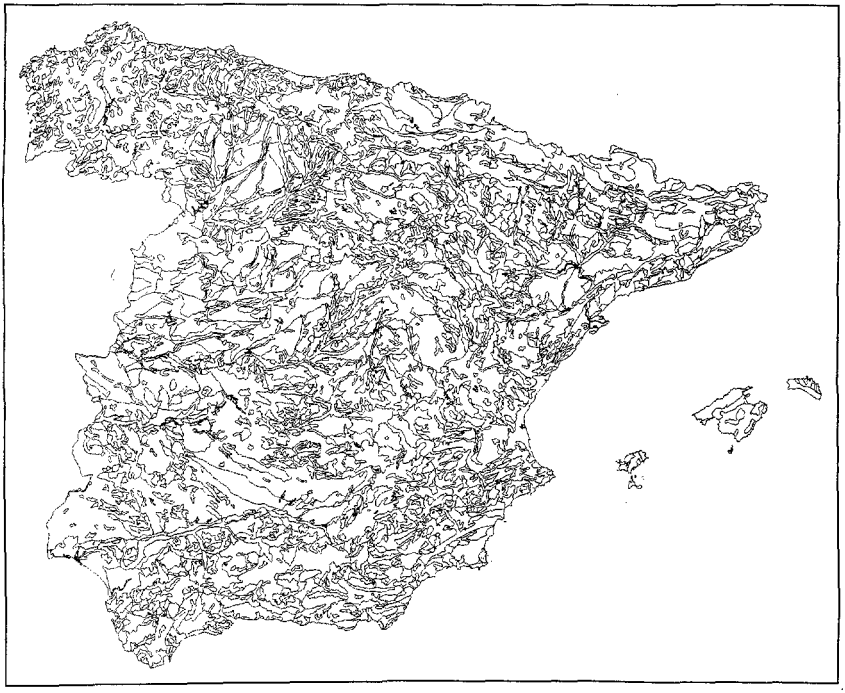


Figure 1: Soil Map Unit (SMU) in Spain.

The map collects the Soil Map Units, characteristic associations of soils.

Coordinates of the control points were in Spain:

Cape Finisterre:	-1475760.608	-395489.742
Cape Creus:	-467485.452	-615712.375
Cape Nao:	-761835.575	-987703.386
Cape Gata:	-999192.433	-1184558.561
Tarifa:	-1314707.666	-1214680.169
Fuenterrabia:	-870340.619	-453335.474

With the Chart we have an attributes database (See Figure 2).

SMU	STU(1)	PCA2	SOIL	TS1	TS2	S1	S2	SP1	SP2	M1	M2	U1	U2	DT	TD1	TD2	ROO	IL	WR	WM1	WM2	WM3	CFL	SOIL-FAO 88
1981	654'	70	Jc	2	3	a		1	2	110		12	3	5	2	1	1	1	1	1	2	7	M	FLc
1981	714'	20	Bk	2		a		1		110		12	3	5	2		1	1	1	1	2	7	M	CLh
1981		10	Jcg	2	3	a		1		110		3		5	2		1	3	3	1	1			FLc
1982	653	80	Je	2		a		1	2	110		3	12	5	2	3	1	1	2	1	2	7	M	FLe
1982		20	Bk	2		a		1		110		3	12	5	2	2	1	1	1	1	2	7	M	CLh
1982	675'	10	Jeg	2	3	a		1	2	110		3	1	5	2	4	1	3	3	1	1		M	FLe
1982		10	Jc	2	3	a		1	2	110		3	12	5	2	3	1	1	2	1	2	7	M	FLc
1982																								
1971		70	Jc	3	2	a		1	7	110		14	6	5	3	2	1	1	3	1	2	7	H	FLc
1971		10	Ce	2		a		21		910		6	14					1	3	1	1	2	M	HSf
1971		20	Rc	2	1	a		1		440		6	14	1	1		1	1	3	1	2	7	H	ARc
1972	654'	70	Jc	2	3	a		1	2	110		12	3	5	2	1	1	1	1	1	2	7	M	FLc
1972	714'	20	Bk	2		a		1		110		12	3	5	2		1	1	1	1	2	7	M	CLh
1972		10	Jcg	2	3	a		1		110		3		5	2		1	3	3	1	1			FLc
1972																								
198	658	50	Ie	2		b	a	4	1	743		1		5			*		1	2				Lpq
198	659	20	Be	2		b	a	4	1	743		1	3	5	2		3	1	1	2	.	.	.	CMe
198	660	20	Lc	2	1	a	b	1	1	743		3	1	1	2		1	1	1	2	.	.	.	LVx
198	661	10	Id	2		b	a	4	1	743		1					*		1	2	.	.	.	LPq
199	662	90	Ie	2		d																		

Figure 2: Attributes of the SMU.

Each SMU is compounded of one or more STU (Soil Typological Units). STU is a soil unit of which each attribute has a unique value. Thus, a set of polygons with the same number have the same characteristics (for all the STUs).

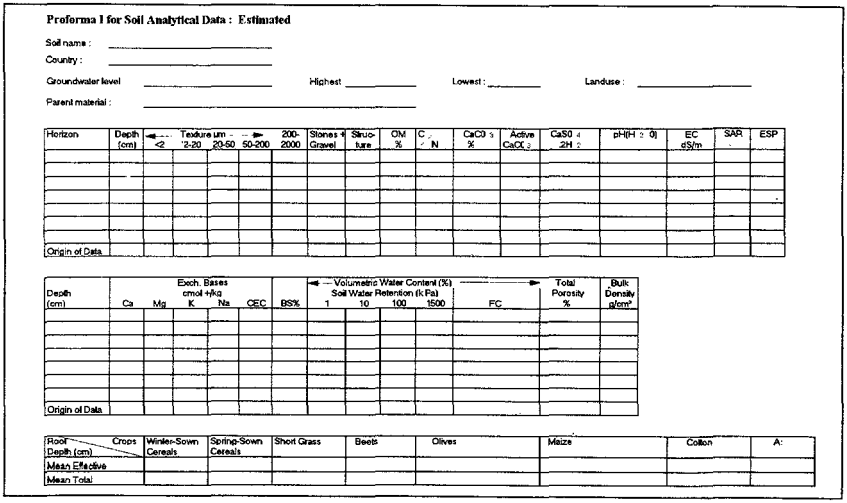
Other attributes included: proportion of the area of the SMU covered by the STU (PCA2), FAO soil name of the STU, surface textural class, slope class, phase, parent material, altitude, land use, depth class to textural change, subsurface textural class, depth class of an obstacle to roots, water management system, presence of an impermeable layer, dominant annual average soil water regime...

2.2 Profiles

The EC Analytical Database has two Proformas:

I. Typical soil profiles mainly characterized by estimated/guesstimated data.
II. Measured data for existing profiles.

Proforma I includes: groundwater level, parent material, landuse, horizon, depth, texture, percentage stones and gravel, structure (according to the FAO, 1986), organic matter, carbon/nitrogen ratio, calcium carbonate equivalent and gypsum content, active $CaCO_3$, sodium adsorption ratio, exchangeable sodium percentage, pH measured in water, electrical conductivity, exchangeable bases, cation exchange capacity and base saturation, soil water retention, porosity and bulk density and root depth.



Proforma I for Soil Analytical Data : Estimated

Soil name : _____

Country : _____

Groundwater level _____ Highest _____ Lowest : _____ Landuse : _____

Parent material : _____

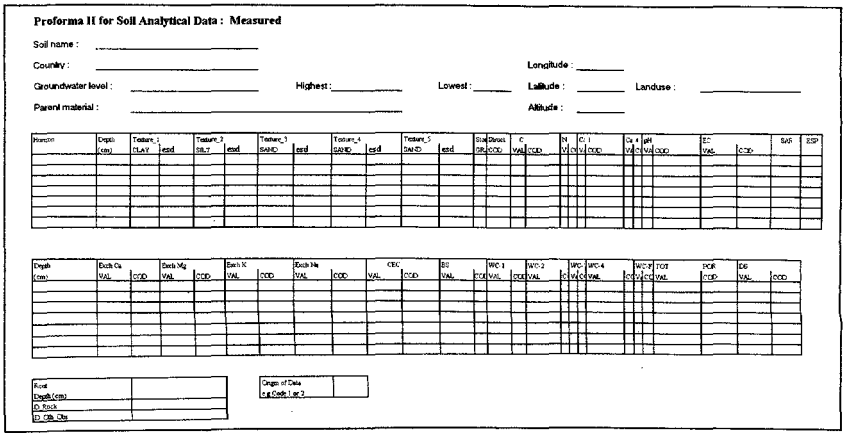
Horizon	Depth (cm)	Texture um <2	2-20	20-50	50-200	200-2000	Stones % Gravel	Structure	OM %	C / N	CaCO3 %	Active CaCO3	CaSO4 .2H2O	pH(H2O)	EC dS/m	SAR	ESP
Origin of Data																	

Depth (cm)	Exch. Bases cmol+/kg Ca	Mg	K	Na	CEC	BS%	Volumetric Water Content (%) Soil Water Retention (-Pa) 1	10	100	1500	FC	Total Porosity %	Bulk Density g/cm³
Origin of Data													

Roof Crops / Depth (cm)	Winter-Sown Cereals	Spring-Sown Cereals	Short Grass	Beets	Olives	Maize	Cotton	A:
Mean Effective								
Mean Total								

Figure 3: EC Soil Analytical Database. Proforma I.

Proforma II includes similar data's measured for existing soil profiles only.



Proforma II for Soil Analytical Data : Measured

Soil name : _____

Country : _____ Longitude : _____

Groundwater level : _____ Highest : _____ Lowest : _____ Latitude : _____ Landuse : _____

Parent material : _____ Altitude : _____

Horizon	Depth (cm)	Texture_1 CLAY	esd	Texture_2 SILT	esd	Texture_3 SAND	esd	Texture_4 SAND	esd	Texture_5 SAND	esd	Str	Struct. COD	C VAL	COD	N VAL	COD	CI 1 VAL	COD	Ca 4 VAL	pH VAL	COD	EC VAL	COD	SAR	ESP

Depth (cm)	Exch Ca VAL	COD	Exch Mg VAL	COD	Exch K VAL	COD	Exch Na VAL	COD	CEC VAL	COD	BS VAL	COD	WC 1 VAL	COD	WC 2 VAL	COD	WC 3 VAL	COD	WC 4 VAL	COD	WC-FC VAL	COD	TOT VAL	PWP	DB VAL	COD

Root Depth (cm)	
D. Rock	
D. Obs. Dist.	

Origin of Data e.g. Code 1 or 3	

Figure 2: EC Soil Analytical Database. Proforma II.

3. The Project in Spain

With every information, we tried to make a consultant system and database to the Spanish technicals and researches. This system was based in the Map of SMUs. Joined it we have hypsometric information (of the Digital Chart of the World), the location of the 25 profiles included in Proforma II and administrative boundaries of Spain. Database of the attributes of SMUs and STUs and profiles (Proforma I and II) are included too. Every information will be keep in a magnetic support for use and diffusion later.

3.1 File Formats and software

.dbf	format of database. dBase III Plus by Ashton Tate.
.ndx	format of index. dBase III Plus by Ashton Tate.
.xls	format of mat page. Excel 4.0 by Microsoft.
.doc	format of document. Word 2.0 by Microsoft.
coverture	format of map. pc/ARCINFO 3.4.1. de ESRI.

ArcView	ESRI
ARCINFO 6.0	ESRI
dBase III +	Ashton Tate
EXCEL 4.0	Microsoft
MSDOS 5.0, 6.0	Microsoft
pcARCINFO 3.4.1	ESRI
Windows 3.1	Microsoft
WORD 2.0 for Windows	Microsoft

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