

22 Soil data from Spain (Andalusia)

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22.1 Introduction

The EU-HYDI database of Andalusia region was obtained from the SEIS.net database (www.evenor-tech.com) which stores soil information from more than 1000 soil profiles. Soil data harmonization was previously stored and performed with the SDBm Plus (De la Rosa et al., 2002), component of MicroLEIS DSS. This soil database is a multilingual soil profile database that stores and retrieves geo-referenced soil attribute data collected in soil surveys and laboratories.

The SDBmPlus database is considered an essential part of any support system for the exploration in decision-making for sustainable agriculture development. However, this sophisticated database can be useful for independent storage of primary soils information assembled at regional or national level, or for temporary storage of data accumulated during a particular soil survey or monitoring exercise at local level.

The FAO-CSIC Multilingual Soil Profile Database (SDBmPlus) was developed by the Consejo Superior de Investigaciones Científicas (CSIC)/Instituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS) and coordinated by D. de la Rosa. Its development is funded mainly by the Spanish Ministry of Environment through the programme SEIS.net.

The CSIC is the legal owner of the SEIS.net database registered under application number 200899900514357 in the Delegate Office of the Intellectual Property Registry in Seville, Spain. On the 2nd of February, 2009, CSIC and Evenor-Tech signed a License Contract by which CSIC grants Evenor-Tech exclusive rights to exploit the MicroLEIS System.

22.2 Number of samples, geographical distribution and pedological variability

The Soil Data Bank, SEISnet, it is integrated by a wide range of information (alpha-numeric, spatial and photographic) useful for public and private-sector agencies involved in land use planning and environmental management. The data bank comprises:

- A first approach to Spanish soils, digital atlas of soil regions (S 1:1.000.000) containing cartography of: types of soil, slope, geology, topography and land use.
- An on-line soil data base of Andalusia region containing physico-chemical and environmental data of 1.043 profiles and 15.048 soil tests. This information is also integrated in the SDBm Plus soil data base.
- A semidetailed soil cartography (S 1:400.000) of Andalusia region, containing cartography of: Lithology, Organic Matter, pH, clay content, slime content, sand content, soil porosity, bulk density and field capacity.
- A collection of 124 photos: 62 soil profiles and 62 landscapes, together with the corresponding morphological description and analytical characterization. These soils are representative of the main pedological traits in the various nature areas of Andalusia and were selected from the global soil data base of SEISnet.

The information of soil profiles collected for the EU-HYDI database was referred to Andalusia region (Figure 22.1). This region is located in Southern Spain and covers an area of

approximately 87.600 km². Its orography is rather complex and elevation varies between 0 and 3479 masl (Mulhacen Peak). Climate is typically Mediterranean semiarid with an average annual precipitation between 300 and 2000 mm and average annual temperatures between <10 and 18 C. Approximately 44,1% of the region is occupied by agricultural areas and 49,8% by natural areas. Both urban and water spaces cover 3%, 3.1% of the area respectively (Bermejo et al., 2011). Most of natural vegetation is Mediterranean forest, mainly evergreen trees such as oaks, pines and firs, with dense riparian forests, and Mediterranean shrubland. Agriculture in Andalusia has usually been based on wheat crops, olive trees and vineyards.

There is a great diversity of soil orders (Table 22.1), and the main order is Inceptisol (26,9%), Entisol (21.2%), Alfisol (19.8%), Vertisol (17.9%), Mollisol (7.2%), Ultisol (4.3%) and Aridisol (2.8%).

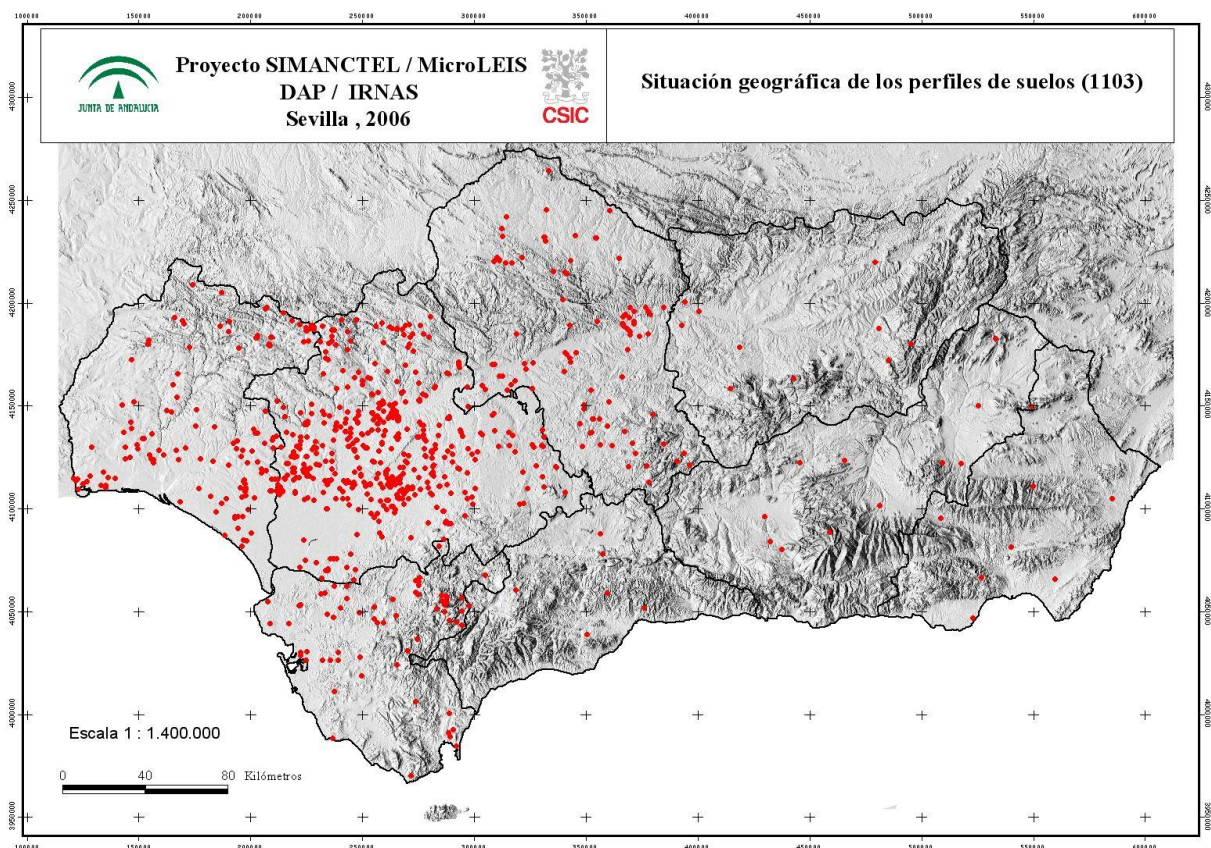


Figure 22.1 Localization of soil profiles across Andalusia region

Table 22.1 Soil taxonomy Classification (USDA, 1975) of representative soil profile of Andalusia

Order	Sub-order	Great-group	Sub-group	Code of representative soil profile*	Area, km ²	
ALFISOLS	Xeralfs	Haploxeralfs	Aquic Haploxeralfs	SE08	627	
			Calcic Haploxeralfs	SE01	217	
			Typic Haploxeralfs	CO06, CO05	3.115	
			Xerochreptic Haploxeralfs	JA07	2.366	
			Palexeralfs	Aquic Palexeralfs	HU05	821
				Typic Palexeralfs	CA04	1.645
		Vertic Palexeralfs		JA03	1.491	
		Rhodoxeralfs	Calcic Rhodoxeralfs	CA03 ,GR10	1.087	
			RupticLithic Rhodoxeralfs	JA05	1.102	
			Typic Rhodoxeralfs	CA06,GR05, JA01, SE02	4.835	
ARIDISOLS	Argids	Haplargids	Vertic Haplargids	AL05	1.254	
	Orthids	Camborthids	Torrertic Camborthids	AL06	1.196	
ENTISOLS	Aquents	Fluvaquents	Salorthidic Fluvaquents	AL04, HU06, SE05	2.202	
	Arents	Rendollic Arents	Typic Rendollic Arents	CA05	747	
	Fluents	Xerofluents	Aquic Xerofluents	GR11	1.368	
			Typic Xerofluents	AL08, CO07, SE09	3.719	
	Orthents	Xerorthents	Lithic Xerorthents	HU02	1.129	
			Rendollic Xerorthents	CO01, GR08, MA03	3.325	
			Typic Xerorthents	AL01, GR01, GR03, GR06	6.073	
			Eutrochrepts	Dystic Eutrochrepts	HU07	3.013
	INCEPTISOLS	Ochrepts	Xerochrepts	Calcixerollic Xerochrepts	AL02, GR07, MA01	4.818
				Lithic Xerochrepts	CO03, HU01, GR04, MA02	7.056
Palexerollic Xerochrepts				AL07	1.146	
Rendollic Xerochrepts				JA06, JA09	2.389	

			Typic Xerochrepts	CO04	2.540
		Cryumbrepts	Typic Cryumbrepts	GR02	1.139
	Umbrepts	Xerumbrepts	Entic Xerumbrepts	HU04	1.472
			Lithic Rendolls	JA08	1.932
		Rendolls	RupticLithic Rendolls	AL03	708
	Ustolls	Haplustolls	Udic Haplustolls	MA05	1.374
			Entic Haploxerolls	SE04	589
MOLLISOLS	Xerolls	Haploxerolls	Typic Haploxerolls	MA04	1.666
ULTISOLS	Xerults	Parexerults	Typic Parexerults	SE06	3.748
			Entic Chromoxererts	GR09	656
		Chromoxererts	Typic Chromoxererts	CA02, CO02 , JA04, SE03 JA02, SE07	11.945
			Chromic Pelloxererts	CA01	1.841
VERTISOLS	Xererts	Pelloxererts	Entic Pelloxererts	HU03	1.249
7	14	19	37	62	87.600

(*) In bold are highlighted the variability of typical profiles of the Mediterranean region. Source : (Catalogo de suelos de Andalucía; De la Rosa et al., 1984).

22.3 Measured soil properties and methods

The SEIS.net data was codified into the SDBm Plus database which includes the following soil attribute datasets: (i) site characteristics, information related to the identification and taxonomic classification of the soil profile; (ii) horizon description; (iii) conventional soil survey analytical results; (iv) soluble salts and most trace elements present in the soil or considered as major soil contaminants; (v) general soil physical analytical results; (vi) water retention and hydraulic conductivity at different tensions; (vii) photographs; and (viii) analytical methods and procedures used.

Then, all data was re-codified attending to the EU-HYDI guidelines database, as results we obtained a new database with the below information:

EU-HYDI database structure of Andalusia region

Full name	Unit	Labels	Method-Code
Profile identification (primary key)	-	PROFILE_ID	
Local coordinates X or longitude		LOC_COOR_X	
Local coordinates Y or latitude		LOC_COOR_Y	
Elevation above sea level	m	ELEV	
Country code (ISO 3166-1 alpha-2)	-	ISO_COUNTRY	

 EU-HYDI database structure of Andalusia region

Full name	Unit	Labels	Method-Code
Region code level 1 (NUTS 2, OBLAST)	-	RC_L1	
Region code level 2 (NUTS 3, ...)	-	RC_L2	
Land Cover at sampling location (LUCAS) level 2	-	LC_L2	
Land Cover at sampling location (LUCAS) level 3	-	LC_L3	
Slope position code (FAO guidelines)	-	SITE_SLOP_POS	
Slope form code (FAO guidelines)	-	SITE_SLOP_FORM	
Slope gradient code (FAO guidelines)	-	SITE_SLOP_GRAD	
Soil surface: rock outcrops: cover (FAO guidelines)	-	SRF_ROCK_COV	
Soil surface: coarse fragments: cover (FAO guidelines)	-	SRF_COAR_COV	
Soil surface: coarse fragments: size (FAO guidelines)	-	SRF_COAR_SIZ	
Soil surface: erosion: category (FAO guidelines)	-	SRF_ERO_CAT	
Soil surface: erosion: degree (FAO guidelines)	-	SRF_ERO_DEG	
Soil surface: sealing: thickness (FAO guidelines)	-	SRF_SEAL_THIC	
Parent material code (ESDB 2002): 4 numbers	-	PAR_MAT	
Contact person	-	CONTACT_P	
Contact e-mail	-	EMAIL	
Sampling depth top	cm	SMPL_DEP_TOP	
Sampling depth bottom	cm	SMPL_DEP_BOT	
Structure grade (FAO guidelines)	-	STR_GRADE	
Structure size (FAO guidelines)	-	STR_SIZE	
Structure shape (FAO guidelines)	-	STR_SHAPE	
Porosity	vol%	POR	
Bulk density	g/cm ³	BD	111
Coarse fragments (>2 mm)	weight%	COARSE	121
Organic carbon content	weight %	OC	131-132
Calcium carbonate	weight %	CACO3	141-142
pH in soil-water suspension	-	PH_H2O	151-152-153-154

EU-HYDI database structure of Andalusia region

Full name	Unit	Labels	Method-Code
Electrical conductivity	mS/cm	EC	171-172
Soluble salt	weight %	SALT	
Cation exchange capacity	meq/100g	CEC	191-192-193-194-196
exchangeable Na	meq/100g	EX_NA	201-202-204
exchangeable Mg	meq/100g	EX_MG	211-212-214
exchangeable K	meq/100g	EX_K	221-222-224
exchangeable Ca	meq/100g	EX_CA	231-232-234
Weight %	weight %	P_PERCENT	600-601-602-603-604-
Water content	cm ³ /cm ³	THETA	605-606-607
Conductivity	cm/day	COND	801-802

22.4 Acknowledgements

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22.5 References

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