ROMANIAN SOIL TAXONOMY SYSTEM SRTS-2012

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Abstract: Soil is the medium that enables us to grow our food, natural fibre and timber. It is not understatement to say that soil is fundamental to the existence of human society. The gradual changes of soil characteristics across the landscape make the study and comparison of different soil types difficult. The credibility of soil science suffers from the lack of a generally accepted system of soil classification. A common language is vital to the functioning of any science. Soil classification is a general term describing any systematic and hierarchical arrangement of soils into categories on the basis of their diagnostic characteristics. During development of knowledge of soils, many kinds of classifications where use before the advent of modern soil science. So called genetic principle remains the guide for most presents day national soil classification. Aware specific terms, Soil Taxonomic recently used in Romania describing that part of soil classification that part of soil classification whereby arrangements of various soil groups and categories are mainly based on natural relationships between various soils. In order to create a common understanding of soil resources in different countries, a new soil classification system, named WRB-SR has been adopted of the International Union of Soil Science. Romanian Soil Taxonomy (SRTS-2012) has been prepared of a group of soil scientists, having as support soil survey and previous soil classification, like Romanian Soil Classification System (SRCS-1980) and the first edition of Romanian Soil Taxonomy System (SRTS-2003). The SRTS 2012 is not a final one. It has to be used, discussed, critized, completed and updated. The SRTS 2012 is organized of 10 chapters and the general principles are: the classification of soils is based on diagnostic horizons, properties and characteristics and the selection of diagnostic horizons, properties and characteristics takes into account their relationship with soil farming processes. The SRTS 2012 is a two-level system of soil taxonomy, a high level, with 12 classes, 29 soil Genetic Types and 67 Soil Subtypes; and a low level, with Soil Variety, Soil Species, Soil Family and Soil Variant. Soil class is defined as a specific pedogenetic horizon or basic property; soil type is represented by soil bodies with similar features and behavior from the same kinds of the main soil forming processes, soil subtypes groups soils characterized by a particular expression of features specific for the soil type. The system presents also correlations between SRCS-1980, SRTS-2003, FAO-UNESCO-1988, WRB-SR-2006 and SRTS-2012.

Key words: soil, classification, taxonomy, map, horizon

INTRODUCTION

Early societies generally revered the earth and tended to deify it. The cult of the earth is perhaps the oldest and most universal element in all religions. Soil is the medium that enables us to grow our food, natural fibre and timber. Virtually, all vegetation, including grasses, arable crops, shrubs and trees, need sail for the supply of water and nutrients and to fix their roots. It is not an understatement to say that soil is fundamental to the existence of human society (CANARACHE A, et all, 2006).

Apart from bare rock, glaciers and water, soil covers the Earth`s surface as a continuum. The gradual changes of soil characteristics across the landscape make the study and comparison of different soil types difficult (WRB, 2006).

The credibility of soil science suffers from the lack of a generally accepted system of soil classification. The very great diversity of soil in different countries may justify national systems; it is indeed hardly possible that one overall system can simultaneously and adequately meet all global, regional and local objectives (FAO, ISRIC, ISSS, 1998).

A common language is vital to the functioning of any science. It is a matter of great concern that after a hundred years of modern soil science a universally accepted system of soil classification has not yet been adopted.

A classification is an organized body of knowledge about something of interest. Three principles deal with the setup of a classification: "purpose" states the reason for wanting to organized soil knowledge; "domain" specifies the universe of objects relevant to the purpose; and "identity" defines and names the individual members of the domain. Four additional principles deal with the organization of a system: differentiation, prioritization, diagnostics and membership.

Soil occurs in most terrestrial environments and commonly has observable properties such as color and structure, arranged as layers; that is, soil have morphology.

Soil classification is a general term describing any systematic and hierarchical arrangement of soils into categories on the basis of their diagnostic characteristics. In this sense, the term is sometimes considered more or less synonymous to soil taxonomy and to soil systematics (ROGOBETE GH,, 1997).

Some other times it has a brother sense that includes general soil classification and also soil taxonomy and land systematics for various practical purposes. The genetic, natural, morphogenetic and morpho-diagnostic soil classification and the soil reference base have been introduced in the more recent times. (SURVEY S, 2006)

Early soil classifications were based on individual characteristics such as the texture of soil or the parent material. During the late 1880`s the Russian geologist Vasili Dokuchaev-now regarded as the father of soil science- was the first to suggested more scientific classification based one the combination of soil characteristics in relation to their formation. This, so called genetic principle, remains the guide for most present day national soil classification, distinguishing features resulting from soil forming processes from those whose origin is geological (WRB, 2006).

Since the 1950`s, most European countries have carried out an intensive soil survey to optimize the efficient use of their land resources. This success has based on well-established national soil classification and standards. The foundation of European Union brought about an increased interdependency for the countries supplies of food and agricultural products (FAO, ISRIC, ISSS, 1998).

Soil properties were described and genetic hypotheses proposed to explain the presence and spatial occurrence of soils. Names were given to different morphologies, eg Podzols and Chernozems and they served as short-hand identifiers of the natural bodies in the environment.

A more specific term, Soil Taxonomy, recently also used in Romania describing that part of soil classification whereby arrangements of various soil groups and categories are mainly based on natural relationship between various soils. It has been introduced in soil science from botany and zoology, where it is based on plants or animals characteristics.

In order to create a common understanding of soil resources in different countries, a new soil classification system, named World Reference Base for Soil Resources (WRB), has been developed and adopted of the International Union of Soil Science. The WRB is not mean to replace national soil classification system can be compared and correlated (WRB, 2006).

MATERIAL AND METHODS

Romanian Soil Taxonomy System have been prepared of a group of soil scientists during a long time, having as support soil survey and previous soil classification, like Romanian Soil Classification System -1980 and the first edition of Romanian Soil Taxonomy System-2003. A decisive role belong to OSPA, which is a governmental institution active at district level in Romania, responsible for soil survey, soil evaluation and soil testing of agricultural land, co-ordinated by ICPA. It includes the field systematic examination, description and classification of soil profiles, mapping of soils and observations of relationships between soil and soil-farming factors and on land use. Subsequently, soil analyses are performed in the laboratory and office activities are done for preparation of soil maps and soil survey reports (MUNTEANU I, 2009).

The International Society of Soil Science has been working to develop a common language for naming the soils of the world and the World Reference Base for Soil Resources (WRB) is designed as an easy mean of communication amongst scientist, in the years of 1998`s and 2006`s.

The Romanian Soil Taxonomy System has a good correlation with WRB and also with the USDA Soil Taxonomy (FLOREA N, 2012).

The SRTS-2012 is not a final one. It has to be used, discussed, critized, completed and updated. It has to be transformed in function of the advantages in soil science.

RESULTS AND DISCUSSIONS

The general principles on which the SRTS-2012 is based can be summarized as follows:

- The classification of soils is based on soil properties defined in terms of diagnostic horizon, properties and characteristics, which to the greatest extent possible should be measurable and observable in the field.
- The selection of diagnostic horizon, properties and characteristics takes into account their relationship with soil forming processes. It is recognized that an understanding of soil forming processes contributes to a better characterization of soils but that they should not, as such, be used as differentiating criteria.
- The SRTS-2012 is organized of 10 chapters follows:
- Introduction
- Morphological characters
- The basis elements of soil taxonomy
- The structure of SRTS-2012
- Soil taxonomy of high level
- Key for soil determinations
- Indicators for soil taxonomy of low level
- Modifications of SRTS-2003 and SRTS-2012, comparatively with SRCS-1980
- Correlation with WRB-SR and USDA-Soil Taxonomy
- Some underlining of the actual problems.

The basis elements of Romanian Soil Taxonomy System are presented in table 1 (FLOREA N, 2012).

The SRTS 2012 is a two level system of soil taxonomy:
- High level, with 12 classes, 29 Soil Genetic Types and 67 Soil Subtypes
- Low level; with Soil Variety, Soil Species, Soil Family and Soil variant.

Soil class is the highest, first level, taxonomic category, defined according to soil profile differentiation, i.e. to presence of a specific pedogenetic horizon or basic property.

Soil type is the second level taxonomic category, represented by soil bodies with similar features an behavior resulting from the same kinds of the main soil-forming processes, acting under a specific combination of pedogenetic factors.

Table 1

Diagnostic horizons, properties and characteristics

Diagnostic horizons	Diagnostic properties and characteristics	Diagnostic parent materials
Principal A molic-Am A umbric-Au A ocric-Ao E luvic- El E albic- Ea E spodic- Es B cambic- Bv B argic- Bt B spodic- Bs, Bhs B criptospodic- Bcp B prespodic- Bpp C calcic- Cca Criic –F Folic –O Turbos –T **Association** A molic-greic- Ame B argic- natric- Btna Salic- sa Hiposolic – sc Natric –na Hiponatric- ac Andic – an Shrinkage-swelling – z Vertic – Bzy Petrocalxic – pc Fragipan – x Scheletifer - q **Special** A limnic- Alm A hortic – Aho Am forestalic – Amf Sulfuratic – sf Sulfuric- su Anthropedogenetic – Aho, aq	**Properties** Aquic: • Gleyic and horizon gleic – G • Reductomorphic – Gr • Redoximorphic – Gox • Stagnic and stagnogley horizon – W Antraquic and antraquic horizon Andic and andic horizon – an Distryc Gelistagnic Salsodic **Caracteristics** Albeluvics tonguing E+B-gl Skeletic- qq Subscheletic – sq Abrupt textural change – pl Vermic - vm **Others elements** Dept of horizon or characteristic Lithic contact Colours Segregated organic matter Secondary carbonates –km BSP, %	Anthropedogenetic materials: MA • Garbic • Spolic • Urbic • Mixic • Reductive Bauxitic material MB Erubasic material ME Fluvic material MF Marnic material MM Calcic material MK

Soil subtype is the lowest subdivision among the high-level taxonomic categories, the third one. It groups together soil characteristics by a particular expression of features specific for the respective soil type or by a specific horizon sequence, sometimes, marking intergrades to other soil types having special practical importance.

Soil variety is the fourth level taxonomic category, a subdivision of soil subtypes, differentiated according to qualitative or quantitative expression of criteria used to separate the respective subtype.

Soil species is based on textural soil characteristics of mineral soils and, respectively, on degree of organic matter decomposition in organic soil.

Soil family is the sixth level taxonomic, a lithologic subdivision within genetic soil subtypes and soil varieties. It is defined according to the nature of the parent material and to its particle-size composition and sometimes also to kind of underlying rock.

Soil variant is the seventh level taxonomic category indicating changes of the profile following agricultural land use or other anthropic influence such as erosion or pollution.

Table 2

Soil Types correlation with other classification

SRTS 2012	SRTS 2003	SRCS 1980	WRB –SR 2006	USDA Soil Taxonomic 2006
Litosol	Litosol	Litosol	Leptosol	Lithic udarthents Lithic ustarthents Lithic Cryortents
Regosol	Regosol	Regosol	Regosol	Orthents
Psamosol	Psamosol	Psamosol	Arenosol	Psamments
Aluviosol	Aluviosol	Sol aluvial Protosol aluvial	Fluvisol	Fluvents
Kastanoziom	Kastanoziom	Kastanoziom	Kastanozem	Ustolls
Cernoziom	Cernoziom	Cernoziom	Chernozem	Ustolls (SE Romania) Udolls (W and central Romania)
Faeoziom	Faeoziom	Faeoziom	Phaezem	Udolls
Rendzina	Rendzina	Rendzina	Rendzic leptosol	Rendolls
Nigrosol	Nigrosol	Sol negru acid	Haplic umbrisol	Humic Dystrudepts
Humosiosol	Humosiosol	Sol humico-silicatic	Humic umbrisol	Humic Dystrocryepts
Eutricambosol	Eutricambosol	Sol bruneumozobazic Sol rosu (Terra rossa)	Eutric cambisol	Eutrudepts Eutrocryepts
Districambosol	Districambosol	Sol brun acid	Dystric cambisol	Dystrudepts
Preluvosol	Preluvosol	Sol brun-ro cat Sol brun argiloiluvial	Haplic luvisol Calcic Luvisol	Hapludalfs Haplustalfs
Luvosol	Luvosol	Sol brun luvic Sol brun –ro cat luvic Luvisol albic	Luvisol-pp Albeluvisol-pp	Hapludalfs Glassudalfs
Planosol	Planosol	Planosol	Planosol	Albaqualfs
Alosol	Alosol	Sol brun luvic holoacid Luvisol albic holoacid	Alisol	Ultic hapludalfs
Prepodzol	Prepodzol	Sol brun feriiluvial	Entic podzol	Haplocryods Haplorthods
Podzol	Podzol	Podzol	Haplic podzol	Haplocryods Humicryods
Vertosol	Vertosol	Vertisol	Vertisol	Hapluderts Haplusterts
Pelosol	Pelosol	VS cromic, PR vertical, CZag-vs, BM vs-pp	Subtypes vertic	Subgroups vertic
Andosol	Andosol	Andosol	Andosol	Hapludands Haplucriands
Stagnosol	Stagnosol	Sol pseudogleic	Stagnosol	Epiaqualfs
Gleiosol	Gleiosol	Sol gleic L covi te	Gleysol	Endoaquepts Endoaquents
Limnosol	Limnosol		Subaquatic fluvisols	Fluviwassents Haplowassists
Solonceac	Solonceac	Solonceac	Solonchak	Aquisalids Haplosalids
Solone☐	Solone☐	Solone☐	Solonetz	Natraquolls, Natrudolls, Natrustalls, Natraqualfs, Natrudalfs, Natrustalfs, Halaquepts
Histosol	Histosol	Sol turbos	Histosol (without Folic histosol)	Fibrists, Hemists, Saprists
Folic subtype	Foliosol		Folic histosol	Folists
Anthrosol	Antrosol		Anthrosol Aric regosol	Anthrepts Udaents
Tehnosol	Entiantrosol	Protosol antropic	Technosol	Arents
Note: Anthrosol erodic Anthrosol aric		Erodisol Sol desfundat		Eroded phases

In order to create a common understanding of soil resources in different countries, we have presented in the SRTS-2012, correlations between SRTS-2003, SRTS-2012, FAO-UNESCO-1988, WRB-SR- 2006 and USDA Soil Taxonomy-2006 (Table 2).

CONCLUSIONS

Soil is increasingly considered as a focal point of environment, with a variety of functions related to: biomass production, cycling of water, gases, nutrients, fate of many contaminants, biodiversity reserve, spatial base for socio-economic activities, geogenic and cultural heritage. International co-operation is depending and expanding, with improved knowledge of concepts in various countries as a basis for technology transfer in agriculture, forestry and other fields.

Soil science has suffered from the lack of a generally accepted system of soil classification which has resulted in a loss of credibility. The great diversity of the soil cover at country scale justifies national systems.

During development of knowledge on soil, many kinds of classification were in use. Some of these classifications are WRB-SR, USDA-ST and SRTS-2012. Romanian Soil Taxonomy System (SRTS-2012) has been prepared of a group of soil scientists, having as support soil survey and previous soil classification. The SRTS-2012 is organized of 10 chapters and the basis elements are diagnostic horizons, properties, characteristics and parent material.

The SRTS-2012 is a two level system of soil taxonomy, high level, with 12 classes, 29 Soil Genetic Types and 67 Soil Subtypes respectively low level, with Variety, Species, Family and variant.

In order to create a common understanding of soil resources in different countries, it has been presented correlations with WRB-SR and USDA-ST.

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