The World Reference Base for Soil Resources (WRB) as an Instrument for the National and International Communication

Othmar NESTROY (✉)

Summary

Whoever studies the WRB in greater detail will know that this system is not intended to replace the individual national soil classification systems, but, as specified in the preface to the WRB, is to be considered as a platform, or "umbrella", serving to promote international understanding in this special field. It should be added that this system is expected to be finalised during the 18th World Congress of the IUSS to be held in Philadelphia in July 2006.

Still, there would be merit even now in giving some thought to this WRB in its 1998 version.

In Austria, a new soil classification system has been used since the year 2000 and has yielded good results. However, national soil type classifications need to be supplemented by classifications according to the WRB in order to be accepted by reviewed journals. The difficulties involved are discussed in this report and illustrated by several practical examples.

In addition, this report presents several examples of soil classification according to the WRB compared with the Austrian and Croatian classification systems: Pararendzina, Leptosol, Mull-Rendzina, Deponieboden, and Typischer Pseudogley.

Using conclusions, this report discusses the favourable effect the WRB has on international understanding in the field of pedology notwithstanding its virtual inability to consider the national peculiarities.

Key words

comparison between the Croatian and Austrian soil classification with the WRB; Rendzinas; Leptosols; Deposols; Stagnosols

[1] Institute of Applied Geosciences, University of Technology, Rechbauerstrasse 12, A-8010 Graz
✉ e-mail: o.nestroy@tugraz.at

Received: June 14, 2006 | Accepted: February 26, 2007

Introduction

The aim of this paper is to establish cross references between national soil classification systems such as those of Austria (Österreichische Bodensystematik 2000 [ÖBS 2000]) and Croatia (Classification of Yugoslav Soils [CYS 1985]) and the World Reference Base for Soil Resources (WRB) in their versions of 1998 and 2006.

Methodological Approach

Anyone working in a natural science discipline will be aware of the necessity and importance of classification and systematic structuring. This naturally includes pedology. In fact, every country possesses its own pedological classification system tailored to its specific natural features. In our age of increasing globalisation, however, international communication has become an urgent requirement. The WRB is intended to serve as a common denominator of national soil classification systems to facilitate such international communication; some basis ideas of the WRB will, therefore, be outlined below by way of introduction:

- Globalization and global environment issues necessitate harmonisation and correlation of technical languages, such as the one used by science. A common language is vital to the functioning of any science.
- The WRB is designed as an easy mean of communication amongst scientists.
- The Reference Base is not meant to substitute for national soil classification systems but rather to serve as a common denominator for communication at an international level. This implies that lower-level categories, possibly a third category of the WRB, could accommodate local diversity at country level. Concurrently, the lower levels emphasize soil features that are important for land use and management (J.A. Deckers et al., 1998).

The second edition of the WRB (=WRB 2006) has undergone a major revision; for instance:

- Technosols and Stagnosols have been introduced, leading to 32 Reference Soil Groups (RSGs) instead of 30:
- Soils with strong human influence:
  - Soils with long and intensive agricultural use: Anthrosols,
  - Soils containing many artefacts: Technosols;
- Soils with stagnating water:
  - Abrupt textural discontinuity: Planosols,
  - Structural or moderate textural discontinuity: Stagnosols;
- Climatic parameters are not applied in the classification of soils.

The main problem involved in such comparisons is the difference in aspects underlying the individual classification systems. The questions at the basis of the WRB mainly relate to quantitative information on diagnostic horizons, properties and materials, whereas the Croatian and Austrian classifications, beeing based on criteria defined by W. Kubiena, are morphological-genetic systems. Comparison with the WRB is made even more difficult by the fact that the WRB also uses a number of terms created by W. Kubiena, involving a potential risk of misunderstanding.

We have two different systems: The morphological-genetic systems (Austria, Croatia) versus WRB with (most quantitative) identification of diagnostic horizons, diagnostic properties, diagnostic materials with partly typenames after W. Kubiena

Comparative Case Studies

Below are five studies (cf. Tables 1 to 5) which are discussed here to illustrate the different possibilities of typological classification.

Whereas Table 1 lists possible ways of transferring a Pararendzina defined according to the ÖBS 2000 and the WRB 1998, Table 2 shows the reverse process that is, transferring a Leptosol defined according to the WRB 1998 to the ÖBS 2000.

A Pararendzina according to the ÖBS 2000 could thus be classified into as many as seven, partly different, RSGs according the WRB 1998.

Table 1. Pararendzina (Austrian Soil Classification 2000, type level) in the WRB 1998

Pararendzina	If continuous hard rock starting within 25 cm or if more than 40% Ca carbonate equivalent starting within 25 cm → Leptosol; else, if mollic horizon, chroma moist ≤2, secondary carbonates → Chernozem; else, if mollic horizon, chroma moist >2, secondary carbonates → Kastanozem; else, if mollic horizon, no secondary carbonates in the matrix → Phaeozem; else, if umbric horizon → Umbrisol; else, if loamy sand or coaser to 100 cm → Arenosol; else → Regosols.

Source: After P. Schad, modified

Table 2. Leptosol (WRB 1998) in the Austrian Soil Classification 2000 (type level)

Leptosol	If alluvial sediments with initial A horizon → Rohboden [rough soil, coarse or fine]; else, if alluvial sediments with 40-75% carbonates (starting within 25 cm) → Schwemmboden [alluvial soil]; else, if O horizon or initial A Horizon over continuous hard rock or coarse gravel → Fels-Auflagehumusboden [overlies humus soil on hard rock]; else, if with continuous silicate- or quartz-rich hard rock → Ranker; else, if with ≥ 75% carbonates (starting within 25 cm) → Rendzina; else, if with 40-75% carbonates (starting within 25 cm) → Pararendzina.

Source: After P. Schad, modified

Table 3. Mull-Rendzina after ÖBS 2000: correlations ÖBS 2000 → CYS 1985 → WRB 1998 → WRB 2006

A (ÖBS 2000) Order *Class* Type Subtype	HR (CYS 1985) Division *Soil Class* Type or Subtype	WRB 1998 Lower-level of reference soil group	WRB 2006 Reference soil group
Terrestrische Böden *Auflagehumusböden und Entwickelte A-C- Böden* Rendzina Mull-Rendzina	Automorphic soils *Humus-accumulative* Rendzinas	A → Mollic Rendzic Leptosol (Calcaric), and/or (deeper) Leptic Calcaric Phaeozem(?), and Calcisol ; HR → Rendzic Leptosol	Rendzic Leptosol (Calcaric, Humic)

Table 4. Deponieboden [Disposal Soil] after ÖBS 2000: correlations ÖBS 2000 → CYS 1985 → WRB 1998 → WRB → 2006

A (ÖBS 2000) Order *Class* Type Subtype	HR (CYS 1985) Division *Soil Class* Type or Subtype	WRB 1998 Lower-level of reference group	WRB 2006 Reference soil group
Terrestrische Böden *Kolluvien und Anthrosole* Deponieboden (Carbonatfreier and Carbonathaltiger)	Automorphic soils *Technologenic* Deposols	A → Spolic Regosol HR → Spolic Regosol	Urbic Technosol (Skeletic, Siltic)

Table 5. Typischer Pseudogley after ÖBS 2000: correlations ÖBS 2000 → CYS 1985 → WRB → 1998 → WRB 2006

A (ÖBS 2000) Order *Class* Type	HR (CYS 1985) Division *Soil Class* Type or Subtype	WRB 1998 Lower-level reference group WRB 2006	WRB 2006 Reference soil group
Hydromorphe Böden *Pseudogleye* Typischer Pseudogley	Hydromorphic soils *Pseudogleyic* Pseudogleys	A → Haplic Planosol (?) without the required abrupt textural change into the profile: HR → Stagnic Gleysol	Haplic Stagnosol (Eutric, Siltic)

A Leptosol as defined by the WRB 1998 could find its home in six ÖBS 2000 types which, however, can be regarded as closer typological neighbours as compared with Table 1.

The following is, analogously to the above, a quadruple comparison of the position a Mull-Rendzina (Table 3), a Disposal Soil (Table 4) and a Typical Pseudogley (Table 5) as defined by the ÖBS 2000 could find in the CYS 1985 as well as the WRB 1998 and WRB 2006.

Mull-Rendzina becomes difficult to classify where the soil thickness exceeds 25 cm and, consequently, can no longer be referred to as Leptosol according to the WRB. Attempts to solve this problem have so far been unsatisfactory. It is greatly to be welcomed, however, that Technosols has been admitted as a RSG in the WRB 2006, which enables easy integration of landfill soils into this group.

The same possibility exists for the Typical Pseudogley, which has been included in the WRB 2006, even where an "abrupt textural change" is lacking. It can now be placed in the RSG of Stagnosols.

Conclusions

- The soil type is still the focal point for international communication.
- General rules for correlation between national systems, such as those of Croatia and Austria, and the WRB 2006 do not exist; these two countries have different suggestions – aiming at an applied subsidiarity method of some kind.
- The composition of a soils profile is more important than the names of soil types it is made of. We must begin with the characteristics of the profile (diagnostic horizons, properties, materials) in the manner of an analysis, and we must find, in a second step, the new profile configuration by way of a synthesis (and perhaps also find a new name for it). (In other words: It is not sufficient to change the head, you must change the whole body).
- It's still difficult to classify Alpine soils by WRB 2006 criteria.

References

Deckers, J.A., Nachtergaele F.O., Spaargaren O.C. (Eds.)(1998): World Reference Base for Soil Resources: Introduction. ISSS, ISRIC, FAO. Acco, Leuven.

Husnjak, S., Rossiter D.G., Hengl T., Milos B. (2004): Soil inventory and soil classification in Croatia: historical review, current activities, future directions. ISRIC World Soil Information Country Series.

Nestroy O. et al. (2000): Systematische Gliederung der Böden Österreichs (Österreichische Bodensystematik 2000). Mitt. d. Österr. Bodenkundl. Ges., H. 60, Wien.

World Reference Base for Soil Resources (1998): World Soil Resources Reports, 84, FAO, ISRIC and ISSS, Rome.

World reference base for soil resources 2006 – A framework for international classification, correlation and communication. Intern. World Soil Resources Reports 103, FAO, Rome.

acs72_02