



International Union of Soil Sciences

25 Points on an Universal Soil Classification System Alfred Hartemink - 15th March 2011

1. A soil – a three phase and dynamic natural system having physical, chemical and biological attributes - is inherently more difficult to classify than a plant, animal, or piece of rock. It is therefore remarkable that there are so many soil classification systems.
2. I think it was Walter Kubiena who compared the soil to a watch. One can grind up a watch and analyse it for its chemical content. One can take it apart and study the individual components. One can observe it and compare it to other watches and see how changes its time. All that with the aim to classify it and give it a name. A fitting metaphor.
3. Ever since soil science developed as a scientific discipline the need was felt to develop standardization in observation, measurement, naming and interpretation. Progress has been made in all those areas.
4. Soil classification systems yielded some sort of common language and standardisation and it brought some insight in key soil properties, processes and soil behaviour.
5. The development of soil classification has been accompanied by much debate and sometimes massive confusion and disagreement.
6. Many systems are based on morphometrics and soil properties as diagnostic criteria; soil processes have received less attention in most modern systems.
7. In pedology there has been an indulgence in developing taxonomic descriptions, but no single system emerged with global approval.
8. An unfortunate consequence of this has been that many physical, chemical, and biological studies have been reported without reference to the taxonomic group on which the study was conducted – equivalent to a botanical study on roots or leaves not referring to the plant species under study.
9. It was envisioned that the ‘Seventh Approximation’ launched at the seventh international congress of the Society in 1960, and further developed and renamed “Soil Taxonomy” may fill this need.
10. Not all efforts have resulted in something that is widely used and understood by non-soil scientists – both nationally and regionally. There are several reasons for the lack of use. First there is the plethora of systems, definitions and technical language that made adoption difficult. Secondly, the existing systems altered with new observations and research and as a result names and concepts changed.
11. If plant taxonomists would have changed as often their naming and system of classification, few other scientists would bother using Latin names. Soil scientists should not be surprised that their classification systems are not being widely used.
12. The World Reference Base for soil resources, which was presented at the 16th ISSS congress as the international soil reference system, is unlikely to be widely accepted if revision after revision is being implemented and soil classes are being added.
13. The lack of an universally used soil classification system retarded the exchange of soil knowledge in several countries and in particular in tropical regions. For example Latosols has a different meaning to different soil scientists as it was used in both the national soil classification systems of Brazil and Indonesia.

14. The lack of adaptation of a globally acceptable soil classification system and its use in guiding land use and management is the result of lack of development in soil classification which has largely dependent on a handful of individuals globally. Soil classification developments was essentially stopped with the reduced funding in soil science that started in the late 1980s in many parts of the world.
15. The Universal Soil Classification System should strive for something that is universally useful, applicable and used (amen). It would be unwise to ignore all previous efforts just as the new system need to be significantly new and not just a relabeling exercise.
16. There is a need for such a system because of the points mentioned previously, but also because we have observation methods (spectroscopy, RS) and potentially a large amount of new soil data. These data can give insight in the way we categorize soils.
17. The Universal Soil Classification system should be numerical, non-hierarchical and integrate quantitative pedogenetics.
18. The system could have a technical part that is mainly used by experts and a communicative part.
19. The system should be as numerical as possible but in the end should yield a name (class, order etc) that can be communicated. So the diagnostics should be numbers, and the system should be automated from the onset. Expert knowledge should guide the automation but not be essential for the classification.
20. Key to a possibly new system is the selection of diagnostics criteria, this includes the concepts of soil formation, horizonation and properties. No doubt this is the most challenging and interesting part. We will have to rely on existing knowledge whilst at the same time allow for new data and insights that may alter our thinking about what soils are and how they behave.
21. A non-hierarchical system has advantages; there are no lower or higher soils. However, at the global (and possibly also in the universe) climate is a key criteria. For disciplinary reasons it would be good if the soil has the key determinants and not lithology, climate, biomes etc.
22. Ideally, the system should not only use soil properties but also pedogenetic processes for distinguishing soils. Distinguishing and making processes morphometric and numerical is difficult.
23. Just like we think that soils are continuous in a horizontal sense some thinking is needed on the continuum in a vertical sense: the horizon is a vertical polygon – a soil class based on a set of properties. We now map soil properties comfortably in a horizontal sense; a new system should be able accommodate the distribution of soil properties in a vertical sense.
24. It is to be hoped that the names of the soil classes will in time become as well known as those of the planets and the orders in the plant and animal kingdoms.
25. It is also hoped that a new classification system will revive pedogenetic studies as our understanding of soil formation and distribution remains behind current and potential soil data collection. We are approaching the stage where we have more data than knowledge (let alone wisdom).