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Catena 64 (2005) 139–141

CATENA

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Preface

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The papers in this special issue of *Catena* arise from the international symposium “25 Years of Assessment of Erosion” hosted by the Department of Soil Management and Soil Care, and the International Centre for Eremology (ICE), Ghent University, Belgium, from 22 to 26 September 2003. The starting point for the symposium was the volume “Assessment of Erosion” of M. De Boodt and D. Gabriels (John Wiley and Sons, Chichester, 1980; 563 pp.) which was based on the proceedings of the workshop on “Assessment of Erosion in America and Europe” held in 1978 at the former Faculty of Agricultural Sciences, State University Ghent (now Faculty of Bioscience Engineering, Ghent University), Belgium. The aim of that workshop was to examine the possibilities of developing methods of universal applicability for assessing degrees of erosion by water and levels of erosion risks. The workshop further provided a synthesis of various approaches for assessing erosion in different parts of the world.

Twenty five years later, we felt the time was ripe to review and report on the progress made in assessing erosion and to evaluate the actual techniques and methodologies. The symposium was designed to review the research done at different scales, from an experimental plot, a farmers’ field, a community, a watershed, a region to a continent. About 150 delegates representing 35 countries covering all five continents participated, which illustrates the worldwide interest in problems related to soil erosion.

The papers in this special issue—15 in total—illustrate the diversity of investigations being undertaken in the field of erosion assessment at different scales. The special issue opens with a personal reflection by R. Evans on (more than) 25 years of assessment of and the policy towards water erosion in England and Wales—Chapter 1. In Chapter 2, L.

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Stroosnijder gives an overview of some measuring techniques for wind and water erosion at various scales. The paper should not be considered as a review paper, but more as a personal view of the author. The author is rather skeptical and makes us, the readers, to reflect about what we have achieved after many years on assessing soil erosion.

The next three chapters focus on soil properties and soil erodibility. In Chapter 3, W. Jester and A. Klik compare new techniques to measure soil surface roughness with more traditional methods. In Chapter 4, a new method to measure and model infiltration of rain into frozen soils is presented by A. Weigert and J. Schmidt. Such submodel could improve the performance of physically based erosion models when applied under winter conditions. Chapter 5 by W. Schiettecatte et al. reports on the impact of rainfall on the temporal variation of some soil physical properties that determine the rate of erosion.

The next two chapters deal with measuring soil erosion rates and sediment load. In Chapter 6, S. Hacıyakupoglu et al. illustrate for a case study in NW Turkey how the Caesium-137 technique—a technique that has been widely adopted over the past years—can be used in assessing the magnitude of the erosion problem and in planning catchment strategies. L. Mateos and J.V. Giráldez present in Chapter 7 a new method to assess sediment load in irrigation furrows which enables studying the partitioning and distribution of suspended and bed load.

The final eight chapters go into modeling of soil erosion at various scales. Chapter 8 by H. Aksoy and M.L. Kavvas gives a comprehensive review of various mathematical models and theories. This chapter focuses on physically based modelling techniques, but also includes a brief discussion on empirical and conceptual models. F.J. Jiménez-Hornero et al. discuss in Chapter 9 a linear and nonlinear theoretical approach for modelling sediment transport. In Chapter 10, S.D. Warren et al. describe and validate a 3-dimensional enhancement of the Universal Soil Loss Equation which is incorporated into a Geographical Information System. A simple methodology to assess erosion risk assessment and the impact on soil productivity is described in Chapter 11 by D. Lobo et al. In Chapter 12, O. Vigiak et al. explore the use of farmers' indicators of erosion as a rapid tool to assess water erosion at the field level (in Tanzania). The promising results make this approach a potential alternative for mathematical models in assessing erosion risk. Chapter 13 by U. Agirre et al. presents a new methodology to predict rainfall runoff at the catchment scale using the unit hydrograph theory. In Chapter 14, V. Hrissanthou demonstrates and compares the empirical USLE with a semi-empirical and a physically based model that were developed over the last 25 years, to assess sediment yield at the outlet of a large basin in Greece. Finally, Chapter 15 by J. Krasa et al. describes two empirically based methodologies currently used in the Czech Republic for assessing silting up of reservoirs due to sediment transport.

Based on the different chapters in this special issue, it can be concluded that there has been a great progress over the past 25 years in our abilities to more accurately measure not only the different parameters affecting soil erosion, but also erosion rates and sediment load. New and sophisticated instrumentation to measure erosion variables in an often automated manner has been developed. Nevertheless, our work is not finished and we, the erosion research community, should continue our research to further improve existing technologies, for our understanding of the erosion processes and the proper use of mathematical models—including the use of high quality input data, and model calibration

and validation—greatly depend on correct measurements. However, in improving our techniques or developing new ones, we should be conscious of the danger of getting drowned in the ever increasing pool of various non-standardized methods. We further need to better define and understand the uncertainty associated with soil erosion data at various spatial as well as temporal scales.

Over the past years, there has further been a great advancement in our understanding of the physics behind the erosion processes. This, together with the introduction of increasingly powerful computers and advanced numerical methods, has led to the development of physically based models of varying level of sophistication. However, despite our progress in understanding soil erosion progresses, the much simpler ‘good old’ empirical models, though now improved and often incorporated into a Geographical Information System, are still very popular and most widely used. Such empirical models have generally a much simpler structure, require less input parameters and show often similar performance in terms of prediction accuracy than deterministic models when considering yearly averages. Reducing model complexity will generally lead to a minimization of the error propagation of erosion models. Although the latter has not been tackled within this special issue or in the symposium as such, it should be given much more attention than it has now in the future. Besides the wide implementation of empirical models, new alternatives for erosion risk assessment tools are even sought in simply using farmers’ indicators. Since the latter shows promising results, we believe that fuzzy techniques enabling to identify computer models on the basis of expert knowledge of the process of soil erosion need more consideration in the future.

Not only our methods to assess soil erosion—by measuring and modeling—have improved over the past 25 years, our community was also asked to formulate answers to new questions. Whereas in the past the focus of soil erosion research was on on-site effects related to productivity of agricultural land, in many countries off-site effects have become increasingly important both from an ecological as well as an economical perspective. Predicting sediment delivery has become as important as predicting soil loss.

Finally, the editors would like to express their sincere appreciation and thanks to all people who contributed their time and effort to make the Symposium “25 Years of Assessment of Erosion” a great success, in particular M.-T. Buyens, E. Delmulle, A. Lostrie, E. Moreels, J. Restiaen, G. Oltenfreiter, W. Schiettecatte and K. Verbist. We further convey our gratitude to all authors and co-authors for their scientific contribution to the symposium and this special issue. We are also greatly indebted to all reviewers, including M. Agassi, M. Ben-Hur, H. Bing So, D.L. Bjorneberg, J. Boardman, J.L.M.P. de Lima, W.E. Dietrich, T. Dostál, N. Fohrer, M.A. Fullen, J.V. Giráldez, K. Helming, P.I.A. Kinnell, A. Klik, J. Kobza, J.M. Lafen, G. Levy, R.J. Loughran, C.M. Mannaerts, J.-Y. Parlange, E.J. Plate, C. Reij, D. Rieke-Zapp, R. Roscoe, D. Sanders, J. Schmidt, S.P. Theocharopoulos, E. van den Elsen, A. Warren and T.M. Zobeck, for their time and dedication. We are also indebted to O. Slaymaker, Editor-in-Chief at *Catena*, for his time and efforts ensuring the high quality of this special issue. We finally would like to thank the Fund for Scientific Research - Flanders for their financial support.