Introduction

Leaching of chemicals from the root zone of agricultural crops continue to endanger the long term groundwater quality in agricultural areas all over the world. The leaching is determined by a range of biological and physico-chemical processes occurring within the soil-root system, and by the land use and climatic settings at the soil-atmosphere boundary. All these variables vary tremendously in time and space, which makes the characterisation of the leaching behaviour in time and space a challenging, but complicated, task.

In comparison to experimental field studies, mathematical modelling allows easily to explore the theoretical leaching behaviour for a wide range of different scenarios. In the past, leaching modelling was mainly done within an academic framework, envisaging to explore the sensitivity of different soil, climate and land use parameters on leaching behaviour. Nowadays however, leaching modelling has also been introduced in decision making, and is used by regulatory officers to assess risks associated with the use of crop protection products in agriculture. As part of the recent efforts to protect water resources in the European union e.g., harmonised registration procedures for crop protection products are developed by the different member states. These procedures are based on uniform principles and places great importance on the use of ‘validated’ mathematical models to calculate environmental concentrations of product residues for different realistic scenarios.

Given the wide range of possible conditions which can be met in practice, there is a wide range of validity needed to accept leaching modelling as a versatile and credible risk assessment tool. Compared to the number of products and the number of scenarios for which risks need to be accessed, only limited comprehensive studies on the validity of the pesticide leaching modelling are presented in the literature. In order to improve this validation status, an attempt was made to carry out such a study in Europe, and the outcome of it is presented in this special issue. Researchers and model users, model developers and data set providers, were invited to co-ordinate their efforts and make a statement on the actual validity of pesticide leaching modelling. To this end, 4 high quality data sets on pesticide leaching were made available and compared to results obtained from 12 different leaching models as used by 36 model users. The implemented procedure allows not only to characterize differences in performances between different models, but also between different model users, and this for a range of, only, but yet four, realistic European scenarios. The papers presented in this issue will definitely help the scientific community to identify the strong points, but also the bottlenecks and shortcomings, in the fast evolving modelling technology. The statements, conclusions and
recommendations should, however, be considered with caution and considered valid for the date of publication. We may expect that conclusions should be revised and updated as new modelling approaches and modelling practices will be presented in future.

This results presented hereafter could only be realised through a network research sponsored by different local organisations and the European Commission through the Cooperation on Science and Technology Programme, COST66: ‘Pesticides and the environment’. The contributors to the special issue, K. Aden, A. Armstrong, N. Baran, I. Bärlund, D. Brockie, R. Bromilow, C. Brown, E. Capri, J. Catt, B. Diekkrüger, S. Ducheyne, M. Dust, O.M. Eklo, B. Ergräber, G. Errera, R. Francaviglia, G. Görlitz, B. Gottesbüren, V. Gouy, E. Granitza, G. Harris, H. Hosang, J. Hutson, N. Jarvis, M. Klein, K. Kolle, H. Leeds-Harrison, A. Matthews, C. Mouvet, P. Nicholls, A. Portwood, S. Rekolainen, B. Remy, H. Resseler, H. Schäfer, P. Sweeney, A. Tiktak, T. van der Linden, L. van der Pas, H. Vereecken, A. Vischetti, and A. Walker are firmly acknowledged for performing the simulation studies. We also acknowledge the numerous anonymous reviewers for helping revising the manuscripts, which definitely improved the quality of the presented material.

Finally, we want to dedicate this special issue to the work performed by R.J., ‘Jeff’ Wagenet, Professor at Cornell University, Ithaca, New York, which passed away in summer 97. Jeff developed in collaboration with Dr. J. Hutson in the early 80s the LEACHP code, which is as a precursor of a range of actual pesticide leaching models. He was a pioneer in pesticide leaching modelling and devoted a range of scientific publications to the work of model validation. With his critical ideas and rigorous scientific comments, he definitely inspired young scientists, researchers and environmental engineers, and the many authors of this issue, in improving the quality of the modelling work they perform.

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