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Behaviour and management of water repellent soils—Preface

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Recently, it has become clear that soil water repellency is much more widespread than formerly thought. Water repellency has been reported in most continents of the world for varying land uses and climatic conditions. Soil water repellency often leads to severe runoff and erosion, rapid leaching of surface-applied agrichemicals, and losses of water and nutrient availability for crops. At present, no optimum management strategies exist for water repellent soils, focussing on minimising environmental risks while maintaining crop production. One of the reasons is that knowledge on water repellent soils is scattered among researchers of different disciplines working at different places throughout the world. In order to obtain a more integral view on many aspects related to soil water repellency, a joint trans-national research project had been funded by several donor organisations, and executed by research institutes and universities in Europe, the USA, and Australia. The present issue contains a selection of papers prepared after conclusion of the project, including an extensive soil water repellency bibliography.

The soil water repellency project, entitled '*Development of amelioration strategies to reduce environmental deterioration and agricultural production losses in water repellent regions*', is the first executed to include and address these issues. The project has been jointly prepared and executed by a research consortium of 8 European, American and Australian research institutes and universities, i.e. Alterra (Wageningen, The Netherlands, project coordinator), University of Wales (Swansea, United Kingdom), University of Aveiro (Aveiro, Portugal), Democritus University of Thrace (Xanthi, Greece), University of Minnesota (Minneapolis, USA), Cornell University (Ithaca, USA), Agriculture Western Australia (Geraldton, Australia), and Deakin University (Warrnambool, Australia). The project was funded by the European Commission (FAIR Program, contract CT98-4027), and the Dutch Ministry of Agriculture, Nature Management and Fisheries, and took place between 1998 and 2002.

In the first section dealing with *the assessment and characterisation of water repellent substances*, 4 papers are presented, the first by Doerr *et al.* dealing with extracting soil compounds associated with water repellency in sandy soils of different origin. Morley *et al.* focus on various organic compounds and their role in generating water repellency. The role of tree stem proximity in the spatial variability of soil water repellency in a eucalypt plantation in coastal Portugal is presented by Keizer *et al.* A second paper of Doerr *et al.* highlights the effects of heating and post-heating equilibration times on assessing the degree of water repellency.

The second section of the special issue focusses on the *occurrence of soil water repellency*. The first paper in this section by Leighton-Boyce *et al.* deals with the temporal dynamics of water repellency and soil moisture in eucalypt plantations. The paper by Ziogas *et al.* focusses on the occurrence of soil water repellency in the north-eastern part of Greece, and the effects of drying on the degree of water repellency. A study on soil water repellency under natural conditions in sandy soils of southern Spain is presented by Moral Garcia *et al.* A second paper of Keizer *et al.* deals with the occurrence of soil water repellency under dry and wet antecedent weather conditions for selected land-cover types in the coastal region of central Portugal. Coelho *et al.* discusses the impact of soil water repellency on hydrological and erosional processes under forest land use in the Mediterranean. A study on the spatial and temporal variability of soil water repellency of Amazonian pastures is presented by Johnson *et al.*

The third section of the special issue is devoted to *hydrology and modelling* aspects. Ferreira *et al.* present a detailed paper on the influence of burning intensity on water repellence and hydrological processes at forest and shrub sites. The effect of soil water repellency on overland flow generation in forest stands is presented in a third paper by Keizer *et al.* Xiong *et al.* discuss the implications of using recycled water in relation to competitive sorption of metals in water repellent soils. Steenhuis *et al.* apply percolation theory to describe water flow in hydrophobic soils. Furthermore, Ritsema *et al.* present a new modelling approach to simulate preferential flow and transport in water repellent porous

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media, while Kramers *et al.* discuss the model parameter sensitivity, and the effects on crop growth and solute leaching.

Fourth section deals with *remediation strategies* to prevent or combat soil water repellency. Dekker *et al.* discuss the effects of regular surfactant treatments on the wettability of a water repellent dune sand soil. A second paper of Xiong *et al.* deals with investigating the effects of clay amendments on adsorption and desorption of copper in water repellent soils in Australia.

We would like to conclude by expressing our hope that the results of the present special issue will act as a stimulus for initiating new research projects on a broad range of topics related to water repellent soil systems. If this can be achieved, we trust that answers will be found, yielding a better understanding of the origins, occurrence, hydrological response, and functioning of water repellent soil systems world-wide.