Introduction

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This special issue deals with the use of fallout radionuclides such as ^{137}Cs and ^{210}Pb as tracers to document soil redistribution at the landscape and watershed level. All the papers in this issue are from studies carried out by the participants of a co-ordinated research project implemented by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture during the period 1995-2000 with the overall aim to refine (including validation and standardization) relevant methodologies for measuring soil erosion and sedimentation using the ^{137}Cs technique across a range of environments. The initial activities of the project focused on validating the approach worldwide in different environments and on developing standardized protocols and refining procedures. As the value of the technique was increasingly recognised, the participants exploited the potential of the technique in a wide range of studies.

The first paper by F. Zapata provides a brief review of the use of the ^{137}Cs technique in soil erosion and sedimentation, including a summary of the work done in the project and future developments in this field. The paper by Pennock examines the relationship between ^{137}Cs-derived soil redistribution rates and quantitatively defined landforms in terrain sites in Canada and such information is a pre-requisite for the technique to be useful in upscaling of process models and regional soil conservation planning. The results clearly indicate that regional-scale patterns of soil redistribution can be developed using the ^{137}Cs technique. The paper of Walling presents two approaches, one of them includes the spatially distributed information rates and patterns of soil redistribution obtained from ^{137}Cs measurements to test the performance of AGNPS and ANSWERS distributed erosion and sediment yield models within catchments. Results indicate that catchments outputs simulated by both models are reasonably consistent with the recorded values, although AGNPS appears to provide closer agreement between observed and predicted values. The paper of Ritchie and McCarty describes the use of ^{137}Cs measurements to establish patterns of soil erosion and redeposition and relates them to soil carbon patterns in upland and riparian areas on a small agricultural watershed in the USA. The ^{137}Cs measurements can be useful for understanding carbon distribution patterns of surface soils in the landscape. The paper of Wallbrink et al. illustrates the combined use of fallout radionuclides and geochemistry to quantify the relative contribution of sediment and P from three different landuses, and the erosion processes within them, to the sediment load within a catchment in Australia. Results indicated that it is possible to assess the contribution of surface and subsoil erosion to offsite sediment and sed-P losses from cultivated, pasture and forest land at the paddock scale. The relative contributions from these landuses to deposited sediment and sed-P at the larger catchment scale were also determined. The fertilizer P contributions were highly episodic and variable. The paper of Schuller et al. describes two approaches utilised in the application of the ^{137}Cs technique to estimate tillage and water induced soil redistribution rates on agricultural land under different land use and management in Chile. Results provided clear evidence of the effects of landuse and management on rates of soil redistribution. Redistribution rates associated with tillage and water and the total rates estimated by the conventional and simplified approaches correlated strongly in the study sites. The paper of Golosov reports on the specific application of the ^{137}Cs-derived Chernobyl fallout to assess soil redistribution in a catchment of Middle Russian Uplands. The pattern of soil redistribution does not reflect soil redistribution for the whole field, because only 16 years elapsed since the Chernobyl accident. Net erosion rates calculated using the ^{137}Cs technique were comparable to soil losses directly measured in the

study field. The paper of Xinbao Zhang et al. reports on the use of the ^{137}Cs technique to assess soil losses on both sloping cultivated land and flat terraces in the Upper Yangtze river basin, China. Results indicated that the severity of soil erosion is strongly related to soil texture and slope gradient. Terracing can largely reduce soil erosion in sloping cultivated land in the basin. The paper of Yong Li et al. describes a study on the assessment of sediment production and sediment sources at both the hillslope and catchment scale in a dam reservoir of the Chinese Loess Plateau using ^{137}Cs activities and ^{137}Cs/^{210}Pb ratios. Surface soil and subsoil were the main sediment sources on the cultivated slopes. Changes in land use greatly affected water soil erosion and the sediment production in the study area. The paper of Bacchi et al compares the estimates provided by the WEPP and USLE models with the rates and spatial patterns of soil redistribution obtained from ^{137}Cs measurements within a small watershed in Brazil. The three methods studied produced different rates and spatial patterns of soil redistribution. The USLE estimated spatial patterns of soil erosion rates presented the best correlation with other studied soil properties. The paper of Bujan et al describes the application of the ^{137}Cs technique in a small basin of the "Pampa Ondulada" region in Argentina. The technique proved to be a sensitive tool to evaluate soil erosion in the study area and slope length appears to be an important property to predict spatial patterns of soil erosion in areas of low slope gradients. The papers of Fulajtar and Theocharopoulos et al describe the use of the ^{137}Cs technique to establish soil erosion rates and redistribution patterns in the hilly loess cultivated areas of Slovakia and a cultivated catchment area in Central Greece, respectively. Both studies have tested several conversion models and examined the relationship between the ^{137}Cs redistribution and topography and soil properties.
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