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# Estimation of erosion and sediment export from an agricultural catchment (1960 – 2000) confronting the outputs of an expert-based model and Cs-137 inventories

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Soil erosion leads to important environmental problems (e.g. muddy floods, reservoir sedimentation) in cultivated areas of the European loess belt. This study aimed to quantify erosion and to determine the impact of rainfall seasonality and land use change on soil erosion over the last 40 years in a 94-ha cultivated catchment of Normandy (France). To this end, scenarios representative of the different land use conditions were simulated using the STREAM expert-based erosion model. A 13-yrs long sequence of rainfall events was run with this model. Results showed that erosion increased dramatically after land consolidation (+168% on average). Interannual variability of erosion is important. After land consolidation, 79% of erosion was observed in summer and autumn, even though these seasons only accounted for 58% of annual rainfall kinetic energy. The bulk of erosion was hence produced by a few intense thunderstorms during this period. Thunderstorms correspond to 5% of rainfall events, but they generate 51% of total annual erosion after land consolidation (and up to 57% of erosion before land consolidation). Confrontation of the model outputs with the erosion rates derived from Cs-137 measurements suggested that soil redistribution within the catchment was very high but that sediment exports from the catchment remained limited (sediment delivery ratio between 1 – 10%). Erosion rates derived from Cs-137 measurements showed an important and organised spatial variability, but erosion rates integrated over larger areas remained in the same order of magnitude than those simulated by the model or were slightly higher. Water erosion would hence not be the only process generating erosion within this catchment. In this context, tillage erosion cannot be neglected to calculate the sediment budget over several decades. These findings show the necessity to simulate sequences of rainfall events to obtain reliable erosion predictions. They also demonstrate the interest of developping expert-based models simulating both water and tillage erosion at the catchment scale to conduct erosion studies over several decades.