



The contribution of erosion in a small cultivated hilly catchment of North Vietnam due to an exceptional rainfall event

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Abstract

In Southeast Asia, soils on sloping lands suffer high erosion rates that exceed tolerable limits due to rainfall patterns (intensity) and agricultural practices. In small hilly cultivated watersheds of Northern Vietnam, erosion rates have a high degree of variability and total amounts discharged that has impacts both on- and off-site, notably a rapid decline in soil fertility and the risk of accelerated reservoir siltation. In Vietnam, exceptional rain events associated with typhoons are the most frequent natural hazard that occurs. Damage is widespread and catastrophic, especially along coastal areas. However, typhoons also cause significant rainfall events in upland cultivated areas of northern Vietnam. Their environmental impact is not yet well documented and typhoons are reputed to drive large soil losses in sloping lands of North Vietnam. This study focuses on the analysis of typhoon Koni that occurred from the 21st to the 23rd July 2003 in a small cultivated catchment of Dong Cao (North Vietnam) where rain, runoff and erosion emanating from a 50 ha catchment were monitored from 2001 to 2009. Over the 8 studied years, the erosion yield over the whole watershed ranged from 1 to 9 t/ha this being dependent on agricultural practices; in 2003, the annual erosion rate was 6.2 t/ha/yr. Previous studies have shown that soil erosion in this catchment was largely driven by land use practices. The annual losses that were measured were within tolerable limits. However it was argued that the role of exceptional rain events that occur infrequently in these areas could have a significant impact in global erosion assessment. Typhoon Koni induced an erosion load of 4.9 t/ha through a single event which was exported mainly as suspended matters (94%). This significant erosion event is characterized with a 32 years return period, it reached 80% of the annual erosion for 2003. Compare to the mean annual erosion of 1.65 t/ha/yr from 2003 to 2008 when the land use was similar with fodder and tree plantation dominance, the annual erosion contribution of the typhoon reached only 9%. Over a period of 32 years, the erosion due to typhoon Koni would represent only 4% of the soil amount saved by the land use control in Dong Cao watershed. This result demonstrated the low impact of exceptional event on soil losses over a long term period. By consequence, this study underlined the importance to consider land use control as a significant concern for watershed management in order to prevent high soil erosion rates.

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