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A grassed waterway and earthen dams mitigate muddy floods and limit sediment transfer to the alluvial plain

O. Evrard (1,4), K. Vandaele (2), B. van Wesemael (1), C. Bielders (3)

(1) Department of Geography, Université catholique de Louvain, Belgium, (2) Water Agency of Sint-Truiden, Belgium, (3) Department of Environmental Science and Land Use Planning, Université catholique de Louvain, Belgium, (4) Fonds pour la Formation à la Recherche dans l'Industrie et l'Agriculture, Belgium (olivier.evrard@uclouvain.be / Fax : + 32 10-472877 / Phone : + 32 10-472991)

Muddy floods, i.e. runoff from cultivated areas carrying large quantities of soil, affect routinely numerous villages in the European loess belt. These floods are mainly generated in cultivated dry zero-order valleys. They cause among other consequences damages to human infrastructures and water contamination by sediments and pesticides. The huge costs of muddy flood damages justify the urgent installation of control measures.

In the framework of a pilot project, a 12 ha-grassed waterway (GWW) and three earthen dams have been installed between 2002 and 2004 in the thalweg of a 300 ha-cultivated dry valley in the Belgian loess belt. The measures served their purpose by preventing any muddy flood in the downstream village, despite the occurrence of several extreme storms (with a maximum return period of 150 years). The catchment was intensively monitored between 2005 and 2007 and 39 runoff events were recorded in that period.

Peak discharge (per ha) was reduced by 69% between the upstream and the downstream extremities of the GWW. Furthermore, runoff was buffered for 5 to 12 hours behind the dams, and the lag time at the outlet of the catchment was thereby increased by 75%. Reinfiltration was also observed within the waterway, runoff coefficients decreasing by a mean of 50% between both extremities of the GWW. Sediment discharge was also reduced by 93% between the GWW's inflow and the outlet. Before the in-

stallation of the control measures, specific sediment yield (SSY) reached 3.5 t ha^{-1} yr^{-1} and an ephemeral gully formed nearly each year in the catchment. Since the control measures have been installed, no (ephemeral) gully has developed and the SSY dropped to a mean of 0.5 t ha^{-1} yr^{-1}. Hence, sediment transfer from the cultivated dry valley to the alluvial plain should dramatically decrease. Given they remain cost-efficient, similar measures should be installed to protect other flooded villages of the Belgian loess belt and comparable environments.