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Human-Landscape interaction in cultivated lowland catchments (Louroux catchment, Loire Valley, France)

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Change of land use or agricultural practices are known to have high impacts on sediment transfer in catchments and rivers. Numerous studies have particularly illustrated these effects in sloping land in tropical areas undergoing deforestation. Much less attention has been paid to lowland humid areas, where permanent land uses have been plowed more recently. However recent studies reported significant erosion rates in these environments despite the gentle topography and the temperate climate.

In order to quantify these changing fluxes of sediment, several instrumentation and historical database analyses were carried out in various catchments of the Loire Valley, France. More particularly, a multiparameter analysis was conducted on sedimentary deposits of a pond created in the 11th century in a catchment representative of cultivated and drained lowland environments where an intensification of agricultural practices has occurred during the last 60 years. The results showed that the initial land consolidation period (1954-1960) was characterized by a dominance of allochthonous material input to the pond. This input represents an erosion of 1900 to 2300 t.km⁻².yr⁻¹ originating from the catchment. Then, between 1970-1990, terrigenous material flow decreased progressively and tended to stabilize, whereas eutrophication and associated primary production increased in the pond. In addition to these temporal changes, material input across the pond during the last 10 years corresponds to a loss of material in the catchment ranging between 90 and 102 t.km⁻².yr⁻¹. While a strong decrease is observed, it still represents a 60-fold increase of the sediment fluxes to the pond compared to the preintensification period. Subsequent research monitoring studies permitted to differentiate between the different sources of sediment and highlight the importance of surface erosion during flood events and of bank erosion during low flows. The increased export of the sediment is primarily due to the very high human-made connectivity of these landscapes that was originally created to evacuate the excess water during the humid seasons.