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A synthetic methodology to assess Soil and Water Conservation measures effectiveness on the catchment sediment budget: the case of the Laaba watershed, Burkina Faso

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The Sahelian countries are increasingly affected by lack of water, soil erosion, desertification and loss of biodiversity. Land and water resources are currently facing an overwhelming pressure due to population growth and to a significant decrease in rainfall rates since the 1970s. Nevertheless, the decrease of the number of rainy days did not affect neither rainfall aggressiveness nor daily rainfall extreme values. Rill and gully erosion, the progressive disappearance of the vegetation and the extension of soil surface crusting result in the reduction of soil thickness, the decrease of nutrients holding capability and water storage loss.

To cope with these issues, Soil and Water Conservation (SWC) works have been highly employed in the Sahelian area. However, a proper cost-effectiveness analysis of these interventions at catchment scale requires a quantitative survey on erosion and sedimentation processes, which is expensive and time-consuming. Where data for calibration and validation of process-based models are scarce, a synthetic method to evaluate the economical sustainability of a proposed intervention could be of paramount importance.

Referring to a field data collection and to a literature survey, the study herein proposed aims to assess the effectiveness of SWC measures, employed to limit soil erosion and reservoir siltation. Using the Laaba watershed (Northern Burkina Faso, Department of Koumbri) as a case study, the catchment sediment budget is estimated by means of topographical, pedologic and land use parameters and the sedimentation rates of the reservoir and the SWC works. Finally, a cost-effectiveness analysis is performed to assess the economical sustainability of SWC interventions.

Although not intended to be quantitative at a local scale, the proposed methodology can be easily implemented for land and water management to prioritize the areas of intervention when data and financial resources are limited, and it is beneficial where the application of detailed process-based models is not possible.