Evaluation of soil factors controlling gully erosion

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Current models for prediction of (ephemeral) gully erosion rely mainly on topographic factors while soil conditions are almost neglected. However, soil erodibility is essential for analyzing and properly modeling gully erosion. But, despite the wealth of studies to characterize soil vulnerability to gully erosion, a universal approach is still lacking. Moreover, a useful and feasible soil characterization for gully erosion prediction at large scale should be based on simple, quick, repeatable and relatively inexpensive tests to perform. In this work an experimental approach to quantify soil contribution on gully erosion is proposed.

From simple methodologies and techniques found in the literature for assessing physical-chemical properties of the soil, a large pool of variables -that presumably underpin gully erosion- were defined. These methodologies includes the use of vane shear apparatus, penetrometers and a mini-rain simulator as well as some current (modified) laboratory tests for assessing soil crustability and erodibility.

Thirteen ephemeral gullies developed under different soil condition in agricultural fields of Navarre (Spain) were selected for experiments. Then, the aforementioned variables were calculated for each of the gullies through field and lab experiments. Furthermore, the most relevant variables were detected by means of multivariate analysis and their contribution to gully erosion was finally quantified by using multiple regression analysis. In addition, gully erosion rates of typical agricultural fields are given.