Mapping gully erosion susceptibility at the regional scale using a likelihood-ratio-based approach: the Isser River area (N Algeria)

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Mapping gully erosion susceptibility in cultivated watershed is important for management decisions. This is particularly the case for the Isser River watershed, close to the town of Algiers (N Algeria), where gully erosion deeply affects most slopes. The advantage of the statistical approach in the modelling of spatial processes is that only a few data are generally needed to produce a susceptibility map at a regional scale. The aim of this research is to test if controlling factors extracted from common spatial data (topographic and lithologic maps, aerial photographs) can successfully be used for gully erosion susceptibility mapping.

For a 51 km^2 sub-basin we mapped 181 gully systems that can extend up to several kilometres in length and up to 10 meters in depth. They cover 20% of the study area. Most of the gully being retrogressive, the model used the highest 50 % of each systems as the dependent variable and 5 controlling factors related to topography (slope and surface curvature), land use, lithology and hydrology (runoff erosivity) as independent variables. The data were collected at a 20 m resolution.

Our gully erosion susceptibility modelling used a likelihood ratio approach based on the comparison, for each independent variable, between two empirical distribution functions (EDFs), respectively for the gully and non-gully areas. It used the ratio of these EDFs as favourability values to build a likelihood function for each factor. The ratio of the two EDFs highlights the difference between the two areas. The susceptibility prediction model was obtained by multiplying the likelihood functions. It provided

relevant results both in terms of prediction rate and susceptibility mapping.