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Rainfall Threshold For Ephemeral Gully Erosion In Foothill Cultivated Lands (Wiśnicz Foothills, Poland)

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The paper presents the results of ephemeral gullies studies carried out in hydrological years 1998-2009 on the Jagiellonian University's farm, which is located in the village of Łazy (Southern Poland). The farm covers an area of 103 ha. The dominant relief type is low hills. Soil erosion hardly ever occurs on the whole area of slopes in the catchment, and transport of eroded material is irregular and not simultaneous. The formation of ephemeral gullies happens once a year or once in a few years. The events are occasional and happen locally. Ephemeral gullies most frequently form and develop on cultivated slopes in natural drainage lines or they are associated with man-made agricultural activities like field borders, furrows, tractor traces and cart roads.
The research carried out in Wiśnicz Foothills shows that the development of ephemeral gullies was limited both by extrinsic (erosivity of rain) and intrinsic thresholds (the length of slope, the presence (or lack of) Bt horizon, soil moisture, type and calendar of crops and farming activities). Ephemeral gullies usually form and develop during single rain or several subsequent rains of high erosivity (of several hundred MJmmha-1h-1) on long cultivated slopes, particularly at the beginning of vegetation period, when most slopes are devoid of vegetation cover or plants are in the initial stage of growth. The process of enlarging and deepening of ephemeral gullies slows down when the incision of a gully reaches Bt horizon. Then the effectiveness of even high erosivity rainfall is much smaller. Similarly, very high erosivity of rainfall in the middle of the vegetation season is not able to cause such serious effect and the intensity of deepening of ephemeral gullies is much smaller. The process of intensified linear water erosion is more significant on commercial farms with a large acreage of crops. As a result all the mapped erosion forms were disposed of by farmers (e.g. by ploughing or filling up). If these forms were left untouched, they would develop and get deepened during consecutive rainfalls of high erosivity, leading as a consequence to the exclusion of strips of land.