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Crop structure in a gully catchment and the development of a loess gully (Lublin Upland, E Poland)

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The study was conducted in a loess gully catchment with an area of 1.23 km2 and height differences of less than 50 m (213-165 m above sea level), located in Kolonia Celejów in the Nałęczów Plateau. This is one of mesoregions of Lublin Upland. In the investigated catchment, loess cover with a thickness of 10-20 m, accumulated during the Vistulian Glaciation, is dissected by a gully system with a depth of 5-15 m and total length of 7.5 km. The gully system is forested in 30% of its area. Until recently, the remaining part of the catchment under agricultural use has been dominated by conventional farming of cereals, potatoes, and sugar beets. Today, 15% of the non-forested area of the catchment is occupied by housing premises, dirt roads, and fallow land, and 45% by orchards with maintained turf, including berry plantations. This type of land management contributes to the retention of precipitation, and protects the soil from flushing. Approximately 20% of the agricultural land is occupied by conventional crops (cereals and root crops), protecting the soil to a moderate degree. Water runoff in the area does not occur every year.

Approximately 20% of the agricultural land is currently occupied by cruciferous vegetables (broccoli and cauliflower), decorative shrubs, and orchards without turf in the first 2 years of use. Water and soil runoff from these crops occurs even several times per year. The majority of the material is retained in the lower part of the field, and the water flows into the gully. The crops in the fields adjacent to the ravine have a direct impact on the development of the gully. If the field is located on a raised headland, the flowing water dissects the edge of the gully, and the eroded material is accumulated on the gully bottom. If the field is located in a valley above the gullyhead, the flowing water dissects the bottom of the gully, and the eroded material is discharged outside the catchment.