



The effect of modification of pedon on distribution of soil moisture, plant growth and yield in loess plateau (E Poland)

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Long-term tillage and water erosion in loess areas resulted in modification of pedon structure and redistribution of soils within the fields. The changes are more significant in the areas of largely differentiated past micro-relief of relatively small differences in height.

The effect of soil redistribution on soil moisture content, plant growth, and yield was studied within a small field (0.72 ha) located in the loess plateau (Lublin Upland, E Poland) in the years 2006-08. Structure of Haplic Luvisol, soil properties, and yield of spring barley (*Hordeum vulgare* L.) were determined in a grid 10x10 m, and plant growth in sites located along the transect. Studies showed that after about 180 years of agricultural land use of the experimental site, small micro-relief forms as depressions and hills were partly or completely leveled by tillage and water erosion. In the effect of relief transformation, soils of eroded profiles represented 47.2, depositional soils 34.7 and non-eroded soils 18.1% of total number of studied pedons. Soil thickness, clay, silt and SOC were spatially correlated with a range of autocorrelation from 28 to 35 m. Soil redistribution affected the soil water content during vegetation season. Significantly higher water content at near soil surface was found on sites with depositional and non-eroded soils in April-May, while on eroded soils in June-July. As antecedent moisture conditions affect the water erosion process, various parts of field area could be responsible for quicker formation of runoff in different seasons of the year. Relation between crop and soil was complex and varied with precipitation during growing seasons. The more rainfall was close to the normal, the more significant positive correlations between the yield and soil thickness, silt and SOC, and negative with clay were found. The relations were reversed in a dry year, when yields were much lower.

Results of the studies showed that loess plateau was significantly transformed during agricultural land use, and soil redistribution affects functioning of hydrological system, plant development and yields. Presence of Bt1 horizon in structure of Haplic Luvisol could be regarded as a threshold for maintaining high productivity potential.