

# Effects of soil redistribution by tillage on variability of soil properties and of inorganic carbon content in the superficial soil layer

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Soil redistribution due to conventional tillage practices has been recognised as severe soil erosion process, which provoke a strong modification of the geomorphology of agricultural landscapes. High tillage erosion rates and field evidences of erosion effects have been reported in agricultural fields under different technological and environmental conditions. This paper is focused on analysing the role of tillage as mechanism for the transformation of soil spatial variability and soil profiles morphology.

In previous studies, it has been established that rates of tillage translocation are proportional to the slope gradient, while the net rates of soil loss or gain are related to the morphology and curvature of the hillslope, i.e., soil loss occurs on convexities and deposition take place in concavities. Thus soil profile truncation occurs through loss of soil mass in the upper horizons on convexities and in the upper areas of the cultivated hillslopes. Conversely, the opposite effect takes place in concavities and the lower areas of the field where the original superficial soil horizons become buried or thickened horizons. At slope sectors of rectilinear morphology (mid-slope positions) a null balance of soil translocation take place, although the highest translocation rates are commonly observed at these slope positions. A substitution of soil material moving downslope takes place in the superficial horizon as a result. This substitution of material can produce formation of "false truncated" soil profiles, in which material of the original superficial A horizon is partially or totally substituted with soil material from a truncated C horizon located upslope.

This paper presents some examples of field evidences of soil redistribution by tillage in an agricultural field in Central Minnesota (USA). At the Skogstad field (Cyrus, Minnesota) spatial patterns of soil properties in the superficial soil horizons with soil profiles morphology along several slope transects are analysed. Special attention is given to the effects of soil redistribution by tillage on the spatial variability of the inorganic carbon content (calcite). A method is presented to estimate lateral expansion rates of the areas presenting truncated and false truncated soil profiles on the upper sectors and convexities of the field. Finally, the paper presents a discussion on the possible implications of the expansion of those superficial soil layers, of high content in inorganic carbon, on the carbon sequestration processes in soils.

**Key Words :** USA, soil redistribution, tillage erosion, soil variability, truncated soils, inorganic carbon, C-sequestration.

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