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Soil-landscape relationships in a small catchment area in western Iran

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Abstract: Soil landscape relationship was studied in an agricultural research station named Kharkeh, approximately 80 km of Sanandaj in Kordestan province of Iran. Ten pedons were dug in different geomorphic surfaces including; summit, shoulder, backslope, footslope, toeslope, and alluvial valley bottoms. The digital elevation model of the region was developed by Surfer and Illwis. Soils include four orders (Mollisols, Entisols, Inceptisols and Vertisols). Samples were taken from different horizons for laboratory analysis. Undisturbed samples were also prepared for micromorphological studies. The soils were grouped in three categories according to the landscape stability and dominant geomorphic processes; group 1: soils formed on steep hillslope positions, group 2: soils formed on the stable summit landscape positions; and group 3: soils formed on alluvial valley bottoms (upper-, mid- and lower section) which is considered as a catena. Topography is the main soil forming factor in groups 1 and 2, while drainage conditions as influenced by the presence of ground water table and vegetation also important factors of soil formation in group 3. Group one soils lack any evidence of horizon development and only show an ochric epipedon. Unstable geomorphic positions and the periodic erosion and deposition have prevented from the development of soils. The soils formed on the summit positions show higher degree of development and are the most developed soils of the study area with regard to the pedogenic processes occurred in the soil. They include one subgroup of Typic Calcixerepts. The Calcification is the dominant pedogenic process. The more stable landscape and denser vegetative growth have accelerated the process of dissolution–precipitation and recrystallisation of calcite. In group 3 soils, surface and ground water flows have created the suitable environment for vegetative growth and OC accumula-

tion. All soils in this landform contain high OC in their surface horizons and are mostly classified as Mollisols. Soils formed on the upper section of the alluvial valley bottom i.e. Typic Calcixerolls with the deepest water table, had lower OC and thinner mollic epipedon comparing to other soils. The soils were not saturated and showed no evidence of redoximorphic featuers. Presence of secondary carbonate and calcic horizons were mainly related to the dissolution of the carbonate in the upper soil horizons and its downward leaching and precipitation in the lower horizons. Speckled and striated b-fabric of the near surface soil horizons are the evidences of carbonate depletion from surface layers. Soils of the mid-valley section i.e. Vertic Haploxerolls, with water table depth (1-2 m) have periodic saturation. Thickness of the mollic epipedons and OC were lower than the soils of the lower valley bottom. Soils of the lower valley bottom or low lands classified as Fluvaquentic Endoaquolls had thick dark mollic epipedons and the highest OC comparing to other soils. In the well-drained soils, illite was dominant. In contrast, in poorly drained soils of the lower valley bottom, smectite was the dominant clay mineral.

Key words; Soil-Landscape, micromorphology, Iran