

Effects of slope and drainage network on soil formation: A case study of Shazand watershed in Arak

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Abstract

Soil maturation is affected by the the five factors of climate, bedrock, topography, living organisms, and time. Topography, as the most important factor involved, contributes to the maturation of soil profiles through creating micro-climatic environments that, in turn, affect soil-water relations, diversity in vegetative cover along the northern and southern stretches, intensity of soil erosion, and transport of rolling boulders or suspended materials. The present study was conducted to achieve a two-fold objective: to unravel the likely relations between geomorphology and agricultural land use, and to exploit geomorphological parameters as ancillary tools in small-scale soil classification without the need for soil sampling. The methodology used is based on the relationships among landform types and their relations with soil. For this purpose, use was made of the relationship between the soil map of the study region (prepared by the Institute of Soil and Water) and the dominant geomorphological parameters including slope, aspect, drainage network, and alluvial fan. Initially, the geomorphology maps of the relevant parameters were prepared in the GIS environment before they were mapped onto those of soil classes using geostatistical tools in the Arc map environment in order to derive the following relationships between soil and each of the slope, hydrology, and alluvial fan parameters: 1) soil quality improves with reducing slope, 2) soil materials and compounds improve in quality for cultivation with increasing depth from the cone tip toward the base of the alluvial fans, 3) more cultivable soils of grade II are observed at the joints of rivers of grade 3 or higher, 4) downstream stretches and alluvial fan ends are dominated by soil with only moisture limitation, and 5) grade I soils are located in areas with low slopes and vertical drainage.

Keywords: Shazand, Geomorphology, Soil classes, Hydrology, Slope, Catena.

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