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Relationship between geomorphic surfaces and the establishment of pistachio gardens in Zarand region, southeastern Iran

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Understanding the complexity and characteristics of terrain is essential to make critical decisions. The purpose of this study was to investigate the effect of geomorphological processes on the agriculture development and pedodiversity in the Zarand region. Major landforms in the study area include alluvial fans, coalescing alluvial fans (Bajadas), salt plains (playas), gypsiferous hills and sand dunes. Pistachio is the most important crop in the study area. Air photo interpretation (API) was used to differentiate geomorphical surfaces based on their formation processes, general structure and morphometry. The geomorphologic map was produced based on the understanding of surveyor, topography, geology, aspect, land cover and land use of study area. A four-level geomorphic hierarchy (landscape, landform, lithology and geomorphic surface) was used to breakdown the complexity of different landscapes of the study area. In playa, three geomorphic surfaces (Pl111, Pl121 and Pl122) were separated based on their different sediment and surface morphology. Not all these geomorphic surfaces are cultivated. Playa is the biggest landscape of the study area in the center of basin. Among different geomorphic surfaces in playa, only Pl111 is cultivated. Results showed that this is mainly due to the geomorphic position of Pl111 unit. Also, terrain attributes act as driving forces such as slope directions and that is why run off streams in these three geomorphic surfaces cause the salts to move from Pl111 toward Pl121 and Pl122 units and accumulate in the surface and subsurface soils in these soilscapes. Moreover, fine particles have simultaneously been accumulated mostly in the same surfaces. These processes interaction has resulted in the formation of a salty clayey hardpan a few cm deep in Pl121 and Pl122 geomorphic surfaces. The salt accumulation is identifiable from air photos and satellite images. All these functions create higher limitations for the growth of pistachio trees in Pl121 and Pl122. The geomorphic processes and pedologic differences are highlighted in taxonomic differentiation at the subgroup level (Typic Haplosalids in Pl111 and Sodic Haplosalids in Pl121 and Pl122). Therefore, the geomorphic processes have led to the formation of different soil communities, which makes the diversity and heterogeneity of the soils and also biodiversity. The diversity indices showed much more variability in geomorphic surface than the other levels. The relationships established between the spatial distributions of vegetation cover, terrain attributes and geomorphic surfaces provide a basis for future development of a tool for mapping spatial distribution of vegetation cover (i.e. pistachio gardens).