Soil Quality Assessment in Different Land Uses Using Multivariate Statistical Analysis

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Abstract

The aim of the study was to investigate the effects of land use on soil quality parameters using multivariate statistical analysis. Soil samples (0-25 and 25-50 cm depths) were taken from three land uses in forest area of Marivan including forest, rangeland, and cultivated land. Soil characteristics of pH, EC, sand, silt, clay and $CaCO_3$ content, water-stable aggregates and their organic carbon content were measured. Principal component, cluster and discriminant analyses were used to evaluate the soil quality. Principal component analysis classified soil properties into five factors. The most important factors were soil aggregates organic carbon content and aggregate stability indices. Schematic distribution of factors and also cluster analysis showed the same pattern. Soil aggregates organic carbon content, water-stable aggregates and aggregate stability indices were the most sensitive factors to land use changes. These soil properties and factors had the same pattern in forest and rangeland, but significantly reduced in the cultivated land use. Land use change from forest to cultivated land resulted in significant decrease of aggregates organic carbon content, water-stable aggregates and also an increase of pH. The results showed the usefulness of multivariate statistical methods for integration of the soil properties and determination of different soil quality indices.

Keywords: Land use, Principal component analysis, Cluster analysis, Discriminant analysis, Soil aggregates, Aggregate organic carbon.

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