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ORIGINAL PAPER

Environmental sensitivity to desertification in northern Mesopotamia; application of modified MEDALUS by using analytical hierarchy process

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Abstract

Poor management, low vegetation cover, and severe erosion are undermining the stability and sustainability of lands. In this study, modified Mediterranean Desertification and Land Use (MEDALUS) method was used to identify environmentally sensitive areas (ESA) to desertification in Tigris Basin, Turkey. Soil samplings (0–20 cm) and field observations were conducted within 3.752 km^2 land. Biophysical and anthropogenic parameters of sampling locations have been integrated and processed by geographic information systems obtaining soil, climate, vegetation, and management quality indexes. Additional six parameters for soil quality and one for management quality were used to adopt MEDALUS to the context of Tigris Basin. The weights for parameters and indicators were calculated using analytical hierarchy process (AHP). Tigris Basin was classified into one fragile and two critical areas using original method, whereas one fragile and three critical classes were defined with the modified method. In the original method, fragile areas represented 5.65% and low-degree critical areas 24.49% and moderate critical areas 69.86% of the study area, which are needed to be monitored for severe land degradation. Modifying MEDALUS allowed to define highly critical areas (51.41%) which have not been detected in the original method. The critical areas are primarily used for field crops with extensive tillage, medium degree of plant cover, low drought resistance, and erosion along with low management quality due to the lack of required environmental protection. The results revealed that adaptation of new parameters and weighting in MEDALUS improved the ability of classifying ESAs for a regional scale to desertification.

Keywords Land degradation · Desertification · MEDALUS · AHP · ESAI · Tigris