DEEJ (2020) 9 (29) 59-74

University of Kashan

Desert Ecosystem Engineering Journal

Journal homepage: http://deej.kashanu.ac.ir

Soil Erosion Risk Assessment Using CORINE Model in Kharestan Watershed, Fars Province

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Received: 26/05/2020 Accepted: 10/02/2021

Extended Abstract

Introduction: Soil erosion is the most important factor in damaging and decreasing the productivity of agricultural soils. Moreover, as the transfer of sediments rich in nutrients through the soil leads to soil erosion and in turn to the decrease in the dams' reservoirs' storage capacity, bringing about adverse economic and eco-environmental consequences such as damage to land resources and decrease in land productivity, soil erosion is regarded as a serious problem in the world. Therefore, estimation of the soil erosion risk is necessary for preserving agricultural lands and achieving sustainable management of watersheds.

Materials and Methods: This study investigated the potential and actual erosion risk in Kharestan region, using CIRINE model together with GIS and RS. The parameters are presented as four separate indices. The model consists of the following steps. First, soil texture, depth, and the percentage of stones and pebbles determine the soil's erodibility map. Second, Fournier and Bagnouls-Gaussen aridity indices which are calculated based on meteorological data would be used to form the erosivity layer.

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DOI: 10.22052/deej.2020.9.29.41

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Third, slope classes would be identified according to the DEM of the study area, and then the potential soil erosion risk (PSER) layer is produced through the overlaying of soil erodibility, erosivity, and slope layers. Fourth, the LULC layer is formed based on the Landsat ETM7 images. Finally, the LULC and the PSER layers are combined to identify the actual soil erosion risk (ASER).

Results: The study's findings indicated that there existed 5 types of soil textures in Kharestan region, including Silty clay, clay lomy, silty clay lomy, sandy lomy, and lomy. It was also found that 75.28% of the study area included clay silty (14.36%), clay loamy and silty loamy clay (60%), and 24.71% of the region comprised of sandy loam and loamy texture. Moreover, three classes were observed for the soil depth of the area, including over 75 cm (60.54%), 25-75 cm (5.92), and below 25 cm (33.53). The findings also indicated that 88.42% of the area was covered with over 10% pebbles, while the rest of the area comprised of below 10% pebbles (plains and hills). In terms of erodibility as a function of soil texture, depth, and percentage of pebbles, 39.24% of the study area was covered by highly erodible soils, while 32.26% of the area was covered by low and 28.48% of it was covered by moderately erodible soil, respectively. In total, about 68% of the study area was erodible. The Modified Fournier Index (MFI) was classified in two classes, the highest value of which was observed in the study area's class 3, indicating a moderate rainfall. In addition, the Bagnouls-Gaussen Aridity index (BGI) was classified into two classes, with its highest value found in Class 3, suggesting the dryness of the area. Comprised of *MFI* and *BGI,* soil erosivity index showed that 60.47% of the region had been located in medium erosivity class and 39.55% of the area had been located in low erosivity class. In terms of potential soil erosion risk, 29.125% of the study area was located in low class, 29.8% in moderate class, and 41.7% in high class. The slope map extracted from the study areas' DEM showed that 68.38 % of the area was located at slope class of below 15% and 31.62 % of the area was located at slope class of over 15%. The actual soil erosion risk was extracted from the overlap of the potential soil erosion risk and vegetation. Surface vegetation was classified into fully protected (8.71%) and unprotected areas (91.69%). The outcome was a map depicting non-erosion, and, low, moderate, and high actual soil erosion risk in the study area. In terms of actual soil erosion risk, 31.14% of the study area were found to be in low class, 31.11% in medium class, and 37.78% in high class areas. The areas high erosion risk areas within the potential erosion risk map were reduced from 41.07% to 37.78% in actual soil erosion risk map after overlapping the vegetation layer.

Discussion and Conclusion: Soil erodibility depends primarily on the structural stability of the soil (and hence its resistance to particle detachment by rain-splash or runoff) and its ability to absorb rainfall. As soils with medium to fine texture have low infiltration rates, the are less transferred when exposed to high velocity of runoff water. Moreover, in shallow soils, the rate of erosion increases due to lower potentials for water holding water and higher overland flow. The study's findings also indicated that the areas with moderate–high erosion risk are located in northern, southeastern, western, and northwestern parts of the region, where the soil and water preservation practices should be focused. Thus, protection and restoration of vegetation in the Kharestan is highly important for the preservation of water and water resources. In the southern, central, and eastern parts of the region, the slope is generally slight and the soil is shallow. However, due to the mountainous nature of the region and the low involvement of human activities, the erosion risks lie in low-class areas.

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Considering the application erodibility, erosivity, slope and surface coverage, the use of CORINE model for determining the potential and actual erosion risk maps could well show different erosion classes in Kharestan region. Moreover, the study's findings confirm the application of the CORINE model in natural resource lands. The study suggested that together with GIS and RS techniques, the CORINE model possesses great potential for producing useful and inexpensive erosion risk information in Iran with low data and in relatively short time.

Keywords: CORINE model, Soil erosion risk (SER), Potential erosion risk, Climate, Kharestan region.