University of Zabol
Graduate School
Departement of Soil Science

Thesis to obtain a master's degree in the field of soil resource management-physics and soil protection

Title:

Comparison of some digital soil mapping methods in spatial modeling of soil erodibility factor in Sistan plain

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Abstract

Soil erosion is one of the most important aspects of natural resource degradation. In the revised universal soil loss equation (RUSLE), the soil erodibility factor (K) is one of the main factors affecting the amount of soil loss, and its determination is essential in estimating soil erosion. Digital mapping is also an effective technique for better expression and interpretation of soil information, and it can be used to quickly and accurately prepare and update soil maps. This research was designed and implemented with the objectives of investigating the variations and spatial distribution of soil erodibility factor (K) and determining the best method of digital soil mapping in modeling the K-factor in the Sistan plain. For the spatial modeling of factor K, the variables of geomorphometry and remote sensing were used. Machine learning models, including random forest (RF) and K-nearest neighbor (k-NN), as well as geostatistical models of ordinary kriging (OK), Co-kriging (COK) and inverse distance weighted (IDW), were utilized for modeling K-factor. The results showed that the RF model predicted K-factor with an overall accuracy of 81% and a kappa index of 0.60, which was better than the k-NN method and the studied geostatistical methods. The largest predicted area belonged to the very high erosion class with 53%. Additionally, the RF model using scenario 1 had the highest accuracy for predicting K-factor with an R^2 of 0.06 and an RMSE of 0.007. The auxiliary variable of valley depth (VD) had the highest importance in predicting K-factor, followed by relative slope position (RSP), which reflects the importance of water flows in the region. Overall, it appears that using the RF method along with auxiliary variables reflecting the conditions of the area (river deltas) can be highly beneficial in creating a digital map of K-factor.

Keywords: remote sensing, geomorphometry, water erosion, Revised universal soil loss equation (RUSLE), random forest.