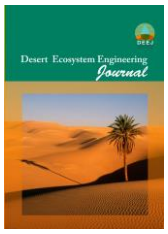
DEEJ (2020) 8 (25) 27-38

University of Kashan

Desert Ecosystem Engineering Journal

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



Evaluation of Groundwater Resources Quality and Its Effect on soil permeability in Borujerd-Doroud Plain Using statistical and geostatistical analysis

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Received: 10/02/2019 Accepted: 02/09/2019

Extended Abstract

Introduction: Considering the increasing population and the growing need for food and drinking water, it is essential to explore and understand the factors of crop production, especially water resources. Today, the removal of undiluted water from underground water sources has produced qualitative issues, in addition to a few shortcomings. These issues are more significant in arid and semi-arid regions, which are more dependent on these resources. In these areas, due to lack of water resources, access to appropriate quality resources is important. The quality of groundwater undergoes spatial and temporal scales and cannot be assumed to be constant over time and place. Therefore, for the purpose of using groundwater resources and targeting for future uses, it is important to consider changes in the quality characteristics of resources over time and place. Therefore, studying the temporal and spatial variations of water quality is essential for properly and efficiently managing the use of these resources. In order to determine the process of time variation, different methods are used. One of the most common non-parametric methods is analysis of the trend in time series using the Mann-Kendall test. It is necessary to know the spatial changes of resources, to collect parameters in different locations, which requires a high cost and time. In such a situation, geospatial interpolation methods can be very efficient. Land use methods can reduce costs and increase the accuracy of estimation, due to the ability of reducing the number of samplings, application of the combination and providing more accurate estimation of variables location. The purpose of this research is investigation of groundwater quality in terms of agricultural use and its effect on permeability in Borujerd-Doroud Plain.

Materials and methods: Boroujerd-Doroud Plain with an area of 2545.8 km^2 is located in northeast of

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DOI: 10.22052/deej.2018.7.25.11

Lorestan province and northernmost part the large Karon Basin. the trend of changes in the parameters of electrical conductivity, calcium, magnesium, sodium and bicarbonate of plain resources during the period of time (1994-2016) was investigated by the Mann-Kendall test and for qualitative maps prepation based on the Permeability Index, Sodium Percentage, and Wilcox, the data of 41 groundwater resources in 2016 were used. The accuracy evaluation of any interpolation or selection of the appropriate parameter is necessary. In the present study, the RMSE index was used to determine the appropriate method. Among different methods, each one with less RMSE is selected as the appropriate method. Different methods of interpolation were compared for the zoning of the quality parameters. Regarding the results of this comparison, the conventional Kriging interpolation method was chosen as the most appropriate interpolation method due to lower RMSE. The permeability index is a parameter that is used to evaluate the quality of irrigation water. Sodium levels of water are important parameters for using water in irrigated agricultural land. Increasing of sodium in water decreases soil permeability. Wilcox classification is one of the most important classifications for determining the quality of agricultural water based on two parameters of electrical conductivity and sodium absorption ratio as alkalinity risk.

Result: The results showed that the trend of changes in all parameters was reduced, which showed that the trend of changes in bicarbonate content was significant at 95% confidence level. In terms of permeability index, 85.84% of the plain has excellent irrigation water quality. Based on this classification, the water quality in northwest of the plain is poor, in southeast is moderate and in other plain areas is excellent for irrigation purposes. Based on the qualitative map of the percent of sodium, the irrigation water quality in northwest and southeast of the plain is excellent, and in the central area of the plain is allowable. The irrigation water quality in other areas of plain is good. The irrigation water quality based on Wilcox's method was classified in two C2S1 and C3S1 classes, which included 90.91% of the studied sources of C2S1 and 9.09% of the C3S1 grade.

Discussion and Conclusion: The quality map based on this classification showed that 85.94% of the plain area has a good water quality. The Investigation of EC and SAR changes effects on soil permeability showed that the variations of these two parameters are not negative across the plain, and the region has a good and moderate permeability status, which is 26.8%.

Keywords: Groundwater, Kriging, Mann-Kendal, Permeability, Water Quality.