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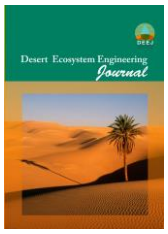

Spatio-temporal Monitoring of Groundwater Changes on Desertification Intensity in Agricultural Areas in Dargaz Plain, Khorasan Razavi Province

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Extended Abstract

Introduction: A lot of part of Iran is covered by dry and semi-arid climate. In these regions, due to the lack of rainfall, agriculture is heavily dependent on groundwater resources. The continuing drought in recent decades and the excessive withdrawal of groundwater aquifers for agricultural development, has led to more land degradation and desertification. Understanding the quality and quantity of groundwater as one of the most important and most vulnerable sources of water supply in recent decades which is so necessary. For optimal groundwater management, it is necessary to collect sufficient information from a set of quantitative and qualitative characteristics of aquifers in different regions and to be evaluated in appropriate ways. Therefore, due to the importance of this issue (non-systematic use of water resources for agricultural activities), the present study aims to assess the process of ground water changes due to the agricultural activities in Dargaz county of Khorasan Razavi province along with the presentation and proposal of management plans for risk reduction Desertification was carried out. Demir et al. (2009) investigated the spatial variation of depth and salinity of groundwater in agricultural areas in northern Turkey using the statistical method of the earthquake. The results of their research showed that the eastern part of agricultural lands in the middle parts of the Black Sea, which has poor drainage, has the highest salinity risk. Akbari et al. (2009), using the Geographic Information System, studied the groundwater level in Mashhad Plain during the twenty years and estimated the average annual loss of 60 centimeters. Their results indicated that the increase in the number of wells in the area and drought, were the main causes of groundwater subsidence decline.

Methodology: The study area is located in northeastern part of Iran and in the north of Khorasan Razavi province. Dargaz County has an area of about 376459 ha. Dargaz Plain is considered as one of the agricultural poles in Khorasan Razavi province. In order to study the process of water change, two sub-criteria of groundwater quantity such as the groundwater table index, and quality indices were used such as water conductivity, sodium adsorption ratio, and chlorine index. For evaluation and zonation of quantitative indices of groundwater level, 124 wells and 111 aqueducts were used and the analyzed using geo-statistical interpolation such as Kriging method in GIS software environment. In addition, groundwater quality criteria have evaluated during the 20 years period of 1996-2016 and in the 5 years' time period.

Validation and verification of the model

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The non-parametric Mann-Whitney Test (Mann and Whitney, 1947) in the Minitab environment was employed to test the model validity. The non-parametric Mann-Whitney test is used to compare two independent categorical groups. The Mann-Whitney test relies on these null and alternative hypotheses: H0: There is no difference between the two groups, H1: There is a difference between the two groups. In the Mann-Whitney test, N is the number of samples randomly selected from the map and sampled in the field. The Mann-Whitney value is compared with the value identified by consulting the significance table

Results: The results showed that the highest rate of groundwater was in the northwestern part of this region. The research area was not badly affected by changes in chlorine concentration and sodium absorption ratio in groundwater, and classified into very low and low. Finally, two quantitative and qualitative indicators of groundwater in the severity of the risk of desertification, the region is located in three low, moderate and severe risk classes, respectively.

Discussion and Conclusions: At present, uncontrolled management of underground water utilization, the development of agricultural land in the traditional way, and the release of lands, have made these areas one of the centers of the erosion crisis. The amounts of changes in the electrical conductivity index in the eastern parts of this region fluctuated from extreme to very intense. It has risen from 14 percent in 1996 to 32 percent in 2011 and finally reaches 23 percent at the end of the year (2016). This condition indicates an early warning stage for the salinity of irrigation water in this area. The results indicate that the rate of groundwater loss in the western and northwest parts of the study region is the highest, mostly, due to the deep and unannounced drilling of wells and the excessive removal of groundwater. Given the current situation and recent droughts, Dargaz Plain Underground Water Management should be considered as a priority for crisis management by officials and experts in executive agencies.

Keywords: Irrigation, Desertification, Interpolation, Salinity, Water Resources Management.