International Journal of Constructive Research in Civil Engineering (IJCRCE)
Volume 4, Issue 4, 2018, PP 20-23
ISSN 2454-8693 (Online)
DOI: http://dx.doi.org/10.20431/2454-8693.0404004
www.arcjournals.org

Qualitative Assessment of Water Resources in Isfahan Desert Basin for Irrigation, Isfahan, Iran

Nastaran Zamani[1], Mohsen Javaheri-Tehrani[2], Mohammad Feizi[3], Kaveh Ostad-Ali-Askari[4*], Saeid Eslamian[1], Vijay P. Singh[5]

[1]*Department of Water Engineering, Isfahan University of Technology, Isfahan, Iran*

[2]*Department of Water Engineering and Hydraulic Structures, Faculty of Civil Engineering, Semnan University, Semnan, Iran*

[3]*Soil and Water Research Department, Agricultural and Natural Resources Research Center, Isfahan, Iran*

[4*]*Department of Civil Engineering, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran*

[5]*Department of Biological and Agricultural Engineering and Zachry Department of Civil Engineering, Texas A and M University, 321 Scoates Hall, 2117 TAMU, College Station, Texas 77843-2117, U.S.A*

Corresponding Author:** ***Nastaran Zamani*, Department of Water Engineering, Isfahan University of Technology, Isfahan,Iran*

Abstract: *Regarding the importance of water and lack of water resources in the country, the use of available water resources is one of the most important strategies for the optimal use of water resources in the agricultural sector. Using irrigation systems under pressure and principled management can be an effective step in saving water reserves. Also, the quantitative and qualitative crisis of resources necessitates the use of new irrigation systems. Therefore, qualitative identification of the water resources of the area in question, planning and prioritizing suitable areas of these irrigation methods seems necessary. In this research, using the land statistics methods, the zoning of each parameter in accordance with the FAO water quality standard No. 29 was studied and the degree of limitation of each factor for the water resources of the desert salt basin was presented. Then, the qualitative water quality map was carried out using a combination of zoning traits. Finally, it was shown that 66% of the agricultural land in the basin is unrestricted and with limited constraints and 34% on the floor with a high constraint.*

Keywords: *Isfahan, Rain Irrigation, Zoning, Desert Salt Basin, Water Quality*

1. INTRODUCTION

Water scarcity is one of the main challenges and constraints of the country's development and development at the national, regional and social levels and economic activities. Given that population growth in Iran is relatively rapid, the water crisis in the near future will be much more complicated than the current one, and, on the other hand, the quality of water supplies will decrease. In this situation, the use of pressurized irrigation systems is one of the most important strategies for the optimal use of water resources in the agricultural sector. On the other hand, much irrigation water in arid and semi-arid areas has a limit on salinity. Application of sprinkler irrigation system in saline water can damage the plant and, in addition, does not cause water use efficiency; it imposes a lot of costs on farmers and the government. There has been a lot of research on groundwater quality assessment. For example, in the field of groundwater quality zonation for use in pressurized irrigation systems, Mir Abbasi Najafabadi et al. (2007) suggests that rain irrigation systems can be implemented only in limited areas in the northeast and east of the plain. Also, Kiani et al. (2011) carried out groundwater quality zoning of Fasa for agricultural purposes using geospatial statistics. For this purpose, the Kriging method was used in Arc GIS10.1 for zoning of total solids soluble TDS. The results showed that the small part of Fasa plain has good water quality and the central part has good water quality, the south and southwest sections have lower water quality than other areas. In addition, GIS technology is one of the best systems that makes it easy and quick to access, analyze, and analyze information. It is used in a variety of fields, including to groundwater quality zoning (1986burrough,). According to the above mentioned, the purpose of this research is to investigate the groundwater

quality of desert basin in Isfahan province in order to use sprinkler irrigation system based on FAO classification.

2. Methods And Materials

The desert salt basin is located in Chaharmahal, Isfahan, Fars and Yazd provinces, but the main part is 108361 hectares in Isfahan province. This basin covers 8 cities and 13 districts and 27 districts in Isfahan province. In Figure 1, a part of the salt desert basin located in Isfahan province is visible.

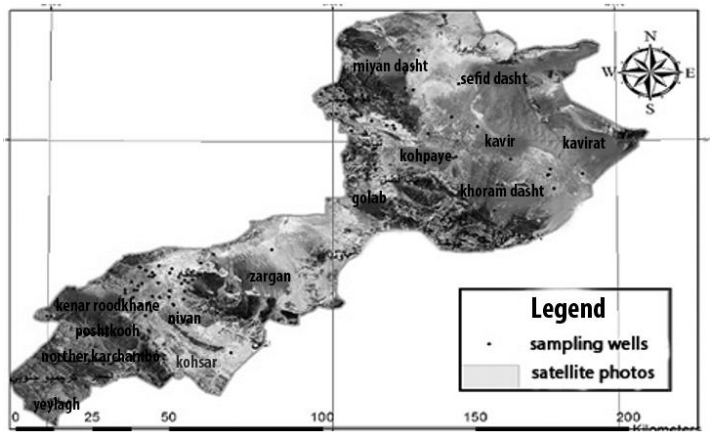

Figure1. *Part of the salt desert basin located in Isfahan province along with the location of sampling wells*

In this study, in order to study the qualitative characteristics of groundwater resources of desert basin and their evaluation for irrigation in agriculture by irrigation under rainy rain, 107 water wells of the basin were planted in 2012-2013. Agricultural samples Cover the area. Characteristics of water chemical resources of groundwater resources include: ECiw water conductivity, acidity (pH), chlorine anions, sulfate and bicarbonate, and calcium, magnesium and sodium captions based on existing standards, total Soluble solids (TDS), Langjeller saturation index (LSI) and total hardness (TH) of irrigation water were measured and calculated. After analyzing and preparing the quality characteristics of groundwater resources in the basin, according to the FAO classification, their assessment was made according to the water quality criteria for irrigation in irrigation systems and their appropriateness for the irrigation system.

Table1. *Guidelines for the interpretation of irrigation water quality in a rainy method (Ayers &Westcat, 1985) (6).*

Parameter	Unlimited	Low to Moderate Limit	High Limit
EC(dS/m)	0.7<	0.3_7	3>
TDS(mg/L)	450<	450_2000	2000>
Na(meq/L)	3<	3>	
CL (meq/L)	3<	3>	-
HCO3 (meq/L)	1.5<	1.8_5.5	8.5>
B (mg/L)	0.7<	0.3_7	3>
RSC	1.25<	1.2_25.5	2.5>
PH	5.4_6.8) usual meal(		

Different parameters were used to determine the different parameters. The Kriging method and different models were used, so that the value of each parameter was separately mapped and the best model based on the lowest residual mean square error (RMSE) was selected. Then, the permitted areas of each parameter were determined according to standards and constraints, and finally all maps were shared and areas susceptible to run rain irrigation systems were identified.

3. Discussion And Results

In Iran, studies have been conducted to determine the permitted salinity levels in rain and drip irrigation. For example, The Mirzaee Tabhthi (2005) refers to the potential of irrigation systems under pressure in the central regions of Kermanshah province. Ghane et al. (2006) conducted an investigation into the potential for irrigation under Arctic view of 12 points in Khuzestan province, which is based on the quality of irrigation water of Gotvand, Dezful and Goshirin stations, and suitable rainforest irrigation and Dezful stations, Molla Sani and Qir Dam are suitable for drip irrigation. Studies in the field of groundwater quality zonation for application in pressurized irrigation

systems by Mir AbbasiNajafabadi et al. (2007) indicate that drip irrigation systems can be implemented in Sirjan plain and rain irrigation systems only in Limited areas are located in the northeastern and eastern plains. Due to the fact that the dominant products in these areas are pistachio trees and this plant is largely resistant to salinity, in these areas, by correcting surface irrigation methods and increasing the efficiency of water use and transfer, the amount of consumption can be reduced to some extent.

Based on the map of the land (Figure 2), located in the area of underground water resources in the catchment area of the salt desert, about 66 percent of the studied land is in the class without limitations and limitations.34 percent of the remaining land on the floor is subject to a high limit. Thus, about 25,617 hectares of land in the unrestricted category, 43370 hectares in the low-floor area and 35527 hectares of land in the category with a high limit.

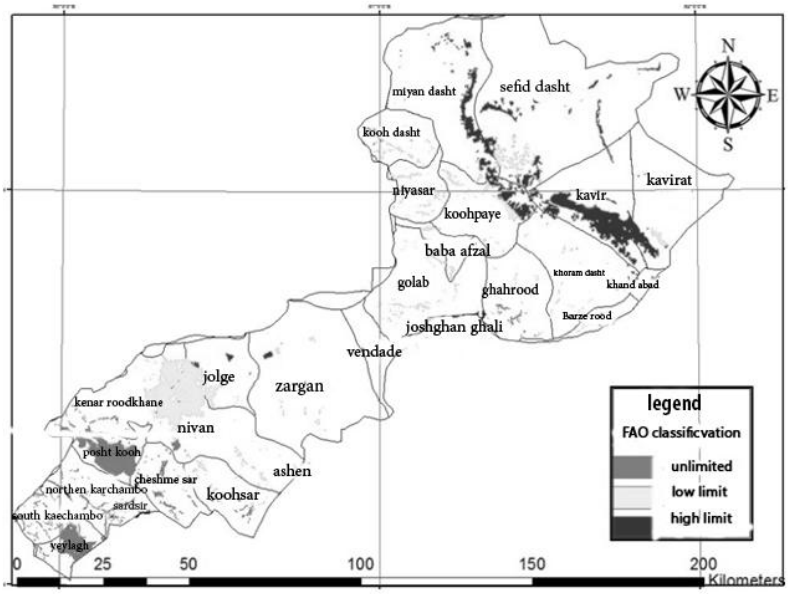

Figure2. *Qualitative zoning of water resources for irrigation by rainy method in the studied area of the Desert Basin (Ayers &Westcat, 1985)*

In Figure 3, the limitations of the studied lands in the desert drainage basin of the province for sprinkler irrigation are presented.

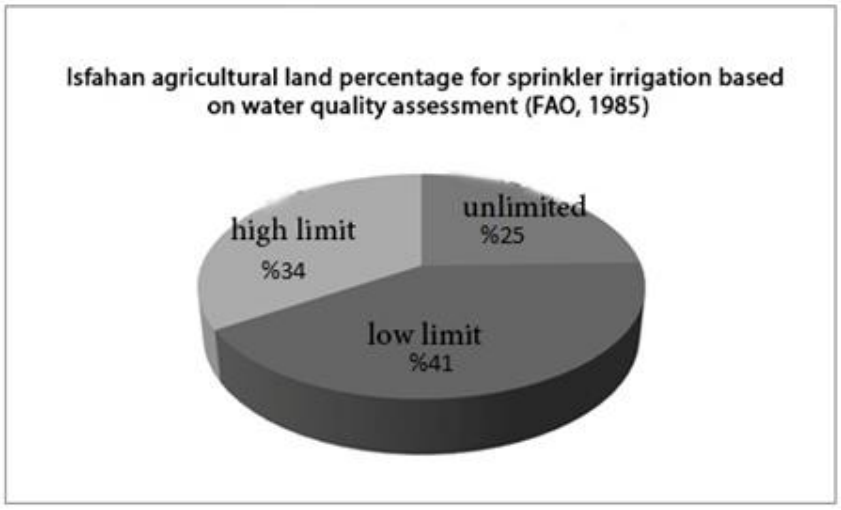

Figure3. *Limitations of the studied area in the desert salt waters of the province for rainy irrigation (Ayers &Westcat, 1985)*

In Table 2, the limitations of different regions of the desert salt watershed in terms of qualitative evaluation of different traits are presented for each of the salinity traits of irrigation water, total salts, sodium, chlorine, bicarbonate, for application in sprinkler irrigation and based on FAO (Ayers &Wescat, 1985).

Table1. *The degree of constraint of the different areas of the desert salt desert in terms of water quality parameters in sprinkler irrigation based on FAO (Ayers &Westcat, 1985)*

High Limit	Low Limit	Unlimited	Parameter
Parts of Aran and Bidgol, Kashan, kavirat	Part of Golpayegan, Barzak, Kashan	parts of the Khansar, Boyin and Miandasht parts of the Golparaygan, Barzak, Kashan parts of Aran and Bidgol, Kashan, deserts	EC
Parts of Aran and Bidgol, Kashan, kavirat	Part of Golpayegan, Barzak, Kashan	Parts of Khwansar, Boyin and Miandasht	TDS
Part of the North of Golpayegan, Barzak, Aran-Bidgol, Kashan, kavirat	Parts of Khwansar, Boyin and Miandasht		Na
Parts of Golpayegan, Barzak , kashan ,kavirat ,Aran- bidgol	Parts of Khwansar, Boyin and Miandasht		Cl
Parts of Golpayegan, Barzak and kashan	Parts of Golpayegan, Khwan sar, kavirat, Aran-bidgol	Parts of Boyin and Miandasht	HCo_3
Parts of Kashan, kavirat, Aran-Bidgol, Niasar, Barzak, Ghamsar	Parts of Golpayegan, Khwansar, Boyin and Miandasht		Bor

4. RESULTS

Water resources are part of the desert salt basin located in Isfahan Province, according to the classification of 29 Fayo (6) for rainwater irrigation.25 percent of the basin lands are located in the limits of unrestricted water sources for sprinkler irrigation, and the salinity of these water resources is less than 0.7 dSm. Altogether, 41 percent of agricultural land is covered by low-water groundwater resources, with salinity levels in the range of 3- 0.7dS.34 percent of the land has water resources with a salinity of more than 3 dS / m, and are subject to a high limit for irrigation under this category.

REFERENCES

[1] Kiani, M, Tabatabai, M, Bahraini Motlagh, M and Keshavarz, AS. 2012 Groundwater quality zoning for agricultural use using land use (case study: Fasa city). Eleventh General Irrigation Seminar and Reduction of Evapotranspiration. Kerman University.

[2] Mir-Abbasi Najaf Abadi, R et al.2008. Quality of groundwater storage in Sirjan plain for the capability of using pressurized irrigation systems using GIS. The first environmental and medical geology conference. Tehran.

[3] Ghane, Abotaleb; HadiMoazed and Nader Hosseini Zare; 2006; "Potential for finding suitable land for irrigation under pressure by software." Arc Veiw Proceedings of the first regional conference on optimal utilization of water resources in the Karoon and Zayandehrood basins of Shahrekord University.

[4] Mirzaei Khattahi, Hossein 2006 "Potential for irrigation systems under pressure in central areas of Kermanshah province. Master's thesis for irrigation and drainage.

[5] Mir Abbas Najaf Abadi R et al 2008 Quality of groundwater storage in Sirjan plain for the capability of using pressurized irrigation systems using GIS. The first environmental and medical geology conference. Tehran 2008

[6] Ayers R S and Westcot D W. 1985. Water quality for agriculture. FAO. Irrig. and Drain. Paper No. 29. Rev. 1, FAO, Rome.

[7] Burrough P A. 1986. Principles of geographical information systems for land resources assessment. Oxford: Clardeon press.

Citation: *Nastaran Zamani, et.al, "Qualitative Assessment of Water Resources in Isfahan Desert Basin for Irrigation, Isfahan, Iran", International Journal of Constructive Research in Civil Engineering, 4(4), pp. 20-23. DOI: http://dx. doi.org/10.20431/2454-8693.0404004*